FURUNO

INSTALLATION MANUAL

MARINE RADAR

MODEL FR-2155

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SAFETY INSTRUCTIONS

WARNING

Radio Frequency Radiation Hazard

The radar scanner emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the scanner aperture from a close distance while the radar is in operation or expose yourself to the transmitting scanner at a close distance.

Distances at which RF radiation levels of 100 and 10 W/m^2 exist are given in the table below.

Note: If the scanner unit is installed at a close distance in front of the wheelhouse, your administration may require halt of transmission within a certain sector of scanner revolution. This is possible Ask your FURUNO representative or dealer to provide this feature.

Model	Radiator type	Distance to 100 W/m^2 point	Distance to 10 W/m^2 point
FR-2155	XN4A	–	0.70 m
	XN5A	–	1.60 m

WARNING



ELECTRICAL SHOCK HAZARD

Do not open the equipment unless totally familiar with electrical circuits and service manual.

Only qualified personnel should work inside the equipment.



Wear a safety belt and hard hat when working on the scanner unit.

Serious injury or death can result if someone falls from the radar scanner mast.

Construct a suitable service platform from which to install the scanner unit.

Serious injury or death can result if someone falls from the radar scanner mast.

Turn off the power at the mains switchboard before beginning the installation.

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

Do not install the display unit where it may get wet from rain or water splash.

Water in the display unit can result in fire, electrical shock or equipment damage.

⚠ WARNING

Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or equipment damage. The voltage rating of the equipment appears on the label above the power connector.

Use only the specified power cable.

Fire or equipment damage can result if a different cable is used.

⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Observe the following compass safe distances to prevent deviation of a magnetic compass:

	Standard compass	Steering compass
Display unit	1.70 m	0.90 m
Scanner unit	3.90 m	2.30 m
Power Supply Unit PSU-001	1.20 m	0.90 m
Power Supply Unit PSU-004	0.50 m	0.30 m

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EQUIPMENT LISTS

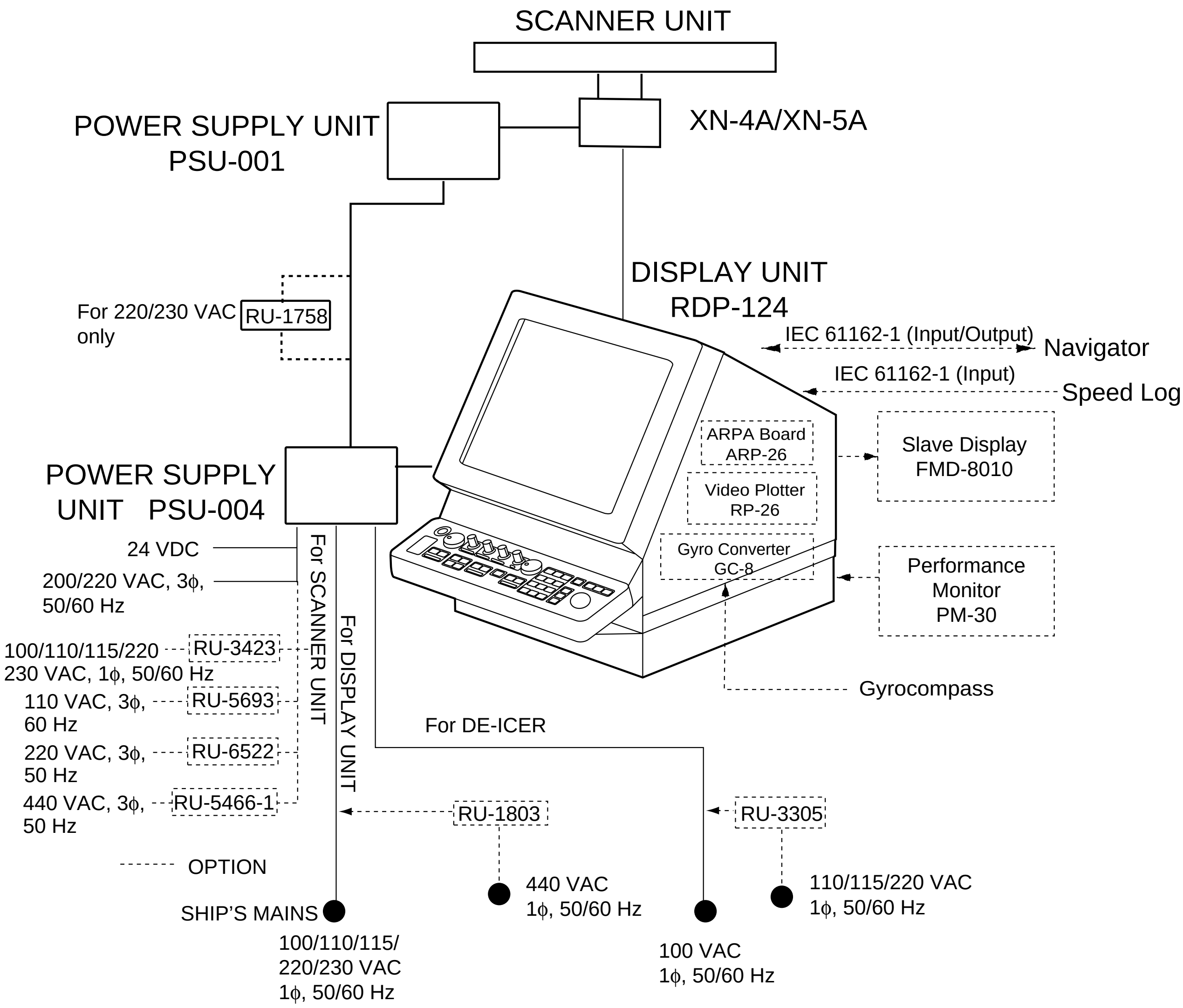
Standard Supply

Name	Type	Code No.	Qty	Remarks
Scanner Unit	XN4A-RSB-0049-N	–	1	2570 mm, no deicer, 200/220 VAC, 3ϕ, 150 W
	XN4A-RSB-0049-I	–		2570 mm, w/deicer, 200/220 VAC, 3ϕ, 150 W
	XN5A-RSB-0049-N	–		3210 mm, no deicer, 200/220 VAC, 3ϕ, 150 W
	XN5A-RSB-0049-I	–		3210 mm, w/deicer, 200/220 VAC, 3ϕ, 150 W
	XN4A-RSB-0050-N	–		2570 mm, no deicer, 24 VDC, 50 W
	XN4A-RSB-0050-I	–		2570 mm, w/deicer, 24 VDC, 50 W
	XN5A-RSB-0050-N	–		3210 mm, no deicer, 24 VDC, 50 W
	XN5A-RSB-0050-I	–		3210 mm, w/deicer, 24 VDC, 50 W
Display Unit	RDP-124	–	1	
Power Supply Unit for Scanner Unit	PSU-001-60	–	Select one	100 VAC
	PSU-001-61	–		110 VAC
	PSU-001-62	–		115 VAC
Power Supply Unit	PSU-004-70-08-S	–	Select one	200/220 VAC, 0.8A
	PSU-004-2-50-S	–		24 VDC
Spare Parts	SP03-12800 (DC power)	000-087-692	Select one	SP03-09203: Scanner unit SP03-12503: Display unit SP03-09202: PSU-001 SP03-10320: PSU-004
	SP03-12810 (AC power)	000-087-693		SP03-12503: Display unit SP03-09202: PSU-001 SP03-10320: PSU-004
Installation Materials	CP03-19500	000--087-694	Select one	CP03-14601: Scanner unit CP03-19103: Display unit CP03-13916: PSU-001 CP03-13907: PSU-004 Signal cable: S03-80-15 (15 m) SEE PACKING LISTS
	CP03-19510	000--087-695		CP03-14601: Scanner unit CP03-19103: Display unit CP03-13916: PSU-001 CP03-13907: PSU-004 Signal cable S03-80-15 (20 m)
	CP03-19520	000--087-696		CP03-14601: Scanner unit CP03-19103: Display unit CP03-13916: PSU-001 CP03-13907: PSU-004 Signal cable: S03-80-15 (30 m)
	CP03-19530	000--087-697		CP03-14601: Scanner unit CP03-19103: Display unit CP03-13916: PSU-001 CP03-13907: PSU-004 Signal cable: S03-80-15 (60 m)
Accessories	FP03-06510	000-089-400	1 set	FP03-06201, FP03-06502, FP03-06503
	FP03-06550	000-089-476		FP03-06201, FP03-06502, FP03-06503, Cosmetic cap CP-30-BC-10, 4 pcs.

Optional Equipment

Name	Type	Code No.	Qty	Remarks
Remote Display	FMD-8010	–	1	
Gyro Converter	GC-8-2	008-446-520	1 set	Separate order
	GC-8-1	008-446-270		Built in
Interswitch	RJ-7	–	1	
Interswitch	RJ-8	–	1	
Performance Monitor	PM-30	–	1	
Transformer Unit	RU-5693	000-030-456	1	110 V → 220 V, for scanner unit
	RU-1803	000-030-497	1	440 V → 100 V, for display unit
	RU-6522	000-030-410	1	220 V → 200 V, for scanner unit
	RU-3305	000-030-448	1	For deicer
	RU-5466-1	000-030-453	1	440 V → 200 V, for scanner unit
	RU-3423	000-030-443	1	AC → DC 24 V, for scanner unit
	RU-1758	000-030-416	1	220 V → 440 V for power supply unit PSU-001
PM Installation Kit	OP03-150	008-485-490	1 set	For PM-30
ARPA	ARP-26	008-485-500	1 set	
Video Plotter	RP-26-T	008-485-510	1 set	Tabletop, console type
	RP-26-Z	008-485-520		For separate control head
Separate Control Head Mounting Kit	OP03-151	008-485-530	1	
Power Cable	CVV-S (8x2C)-15 m	000-560-634	1	For DC spec. display unit
Alarm Kit	OP03-156	008-500-650	1	

SYSTEM CONFIGURATION



I/O Data Sentences

Input: GGA, RMA, RMB, RMC, GLL, ZDA,VBW, VHW, VTG, MWV, VWT, VWR, VDR, DPT, DBT, DBS, MTW, BWR, BWC, WPL, RTE

Output: RAOSD, RARSD, RATTM

MOUNTING

1.1 Scanner Unit

Mounting considerations

- The scanner unit is generally installed either on top of the wheelhouse or on the radar mast, on a suitable platform. Locate the scanner unit where there is a good all-round view.
- No funnel, mast or derrick should be within the vertical beamwidth of the scanner in the bow direction, especially zero degrees ±5°, to prevent blind sectors and false echoes on the radar picture.
- It is rarely possible to place the scanner unit where a completely clear view in all directions is available. Thus, you should determine the angular width and relative bearing of any shadow sectors for their influence on the radar at the first opportunity after fitting.
- Locate the antenna of a direction finder clear of the scanner unit to prevent interference to the direction finder. A separation of more than two meters is recommended.
- To lessen the chance of picking up electrical interference, avoid where possible routing the signal cable near other onboard electrical equipment. Also avoid running the cable in parallel with power cables.
- A magnetic compass will be affected if placed too close to the scanner unit. Observe the following minimum compass safe distances to prevent deviation of a magnetic compass: Standard compass, 3.90 m, Steering compass, 2.30 m.
- Do not paint the radiator aperture, to ensure proper emission of the radar waves.
- The signal cable run between the scanner and the display is available in lengths of 15 m (standard), 20 m, 30 m and 60 m. Whatever length is used it must be unbroken; namely, no splicing allowed.
- Deposits and fumes from a funnel or other exhaust vent can adversely affect the aerial performance and hot gases may distort the radiator portion. The scanner unit must not be mounted where the temperature is more than 70°C.
- The scanner base is made of cast aluminum. To prevent electrolytic corrosion of the scanner base, use the seal washers and corrosion-proof rubber mat and ground the unit with the ground wire (supplied).
- Leave sufficient space around the unit for maintenance and servicing. See the scanner unit outline drawing for recommended maintenance space.

- The scanner unit is normally mounted with the gland side (cable entry side) facing the ship's stern. If this direction is not possible, the gland orientation can be changed in increments of 90°. In this case, the synchronous gear magnet, which produces the heading signal, should be remounted. Fix the magnet according to scanner unit orientation.

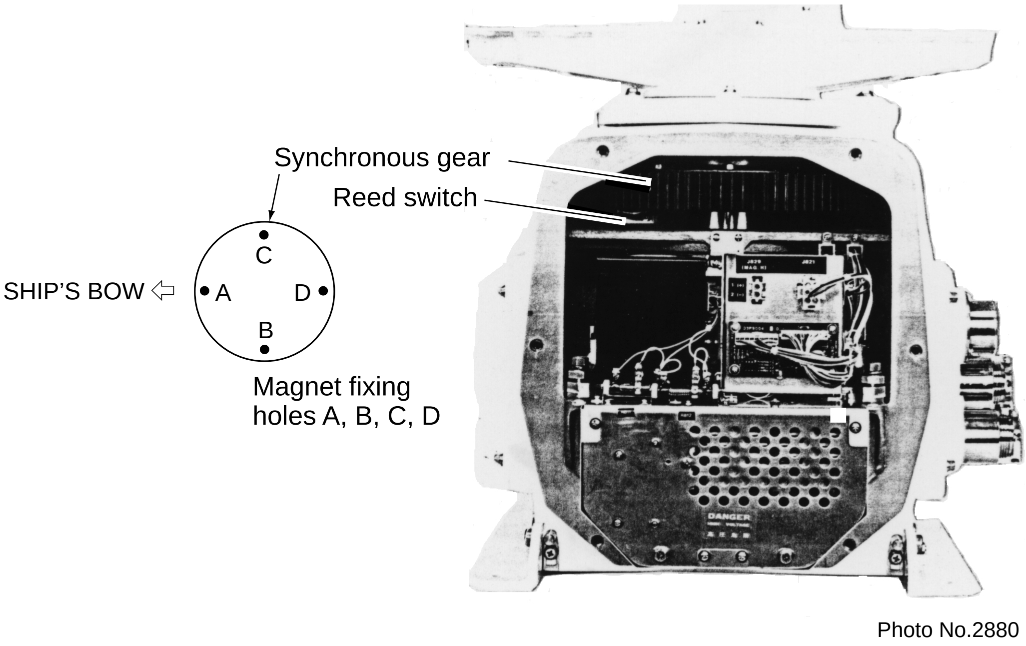
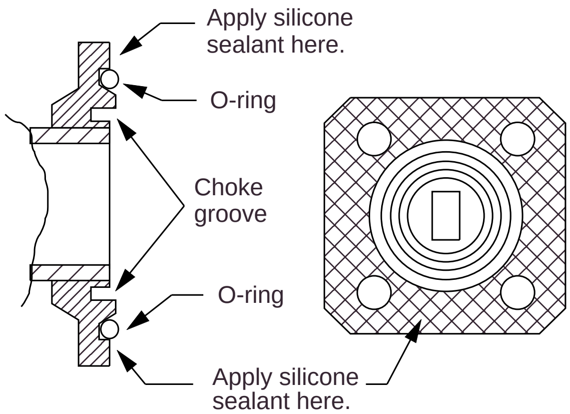


Figure 1-1 Remounting the synchronous gear magnet

Scanner unit assembling

The scanner radiator and the scanner housing are shipped in separate packages and must be assembled at installation. Assemble them as below. Refer to the scanner unit assembling drawing at the back of this manual for details.

1. Remove two protective caps from the radiator flange and rotary joint flange.
2. Grease an O-ring and place it in the groove of the rotary joint flange. Make sure the O-ring is not pinched during assembling.
3. Secure the feeder waveguide to the rotary joint flange with four M6x16 hex bolts.
4. Fix the feeder waveguide on the radiator joint with four M4x16 washer head bolts. Coat waveguide flange with silicone sealant as illustrated below.



Evenly coat the waveguide flange with silicone sealant. Apply sealant sparingly; it leaks out slightly when the fixing bolts are tightened. Be sure no sealant contacts the choke groove and waveguide.

Figure 1-2 How to coat waveguide flange with silicone sealant

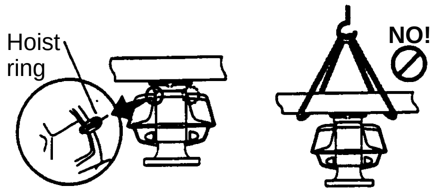
5. Loosely fix the radiator to the radiator bracket with M8x25 and M8x30 hex head bolts, M8 flat washers, M8 spring washers, and M8 hex nuts.
6. Grease the other O-ring and place it in the groove of the radiator flange. Secure the feeder waveguide to the radiator flange with M4x16 washer head bolts.
7. Fix the feeder waveguide to the bottom of the radiator with the waveguide clamp, waveguide packing, M4x30 hex head bolts, M4 flat washers, and M4 spring washers.
8. Tighten bolts loosely fixed at step 5.

Scanner unit mounting

The scanner unit should be assembled before hoisting it to the mounting platform. When using a crane or hoist, lift the unit by the hoist rings which should be fastened to the bolt fixing covers of the scanner housing. Do not lift it by the scanner radiator.

⚠ CAUTION

DO NOT lift the scanner unit by the radiator; lift it by the hoist rings. (Be sure to remove rings after lifting the scanner.)



1. Construct a suitable mounting platform referring to the outline drawing at the back of the manual.
2. Drill four mounting holes of 15 mm diameter and one cable entry hole of about 50 mm diameter in the mounting platform.
3. Lay the rubber mat (supplied) on the mounting platform.
4. Place the scanner unit on the rubber mat orienting the unit so the bow mark on its base is facing the ship's bow.
5. Fasten the scanner unit to the mounting platform with M12x60 hex bolts, nuts, flat washers and seal washers.
6. Using hex bolt (M6x25), nut (M6) and flat washer (M6) establish the ground system on the mounting platform as shown in Figure 1-3. Connect the ground wire (RW-4747, 340 mm, supplied) between the grounding point and ground terminal on the scanner unit. Coat the entire ground system with silicone sealant (supplied).

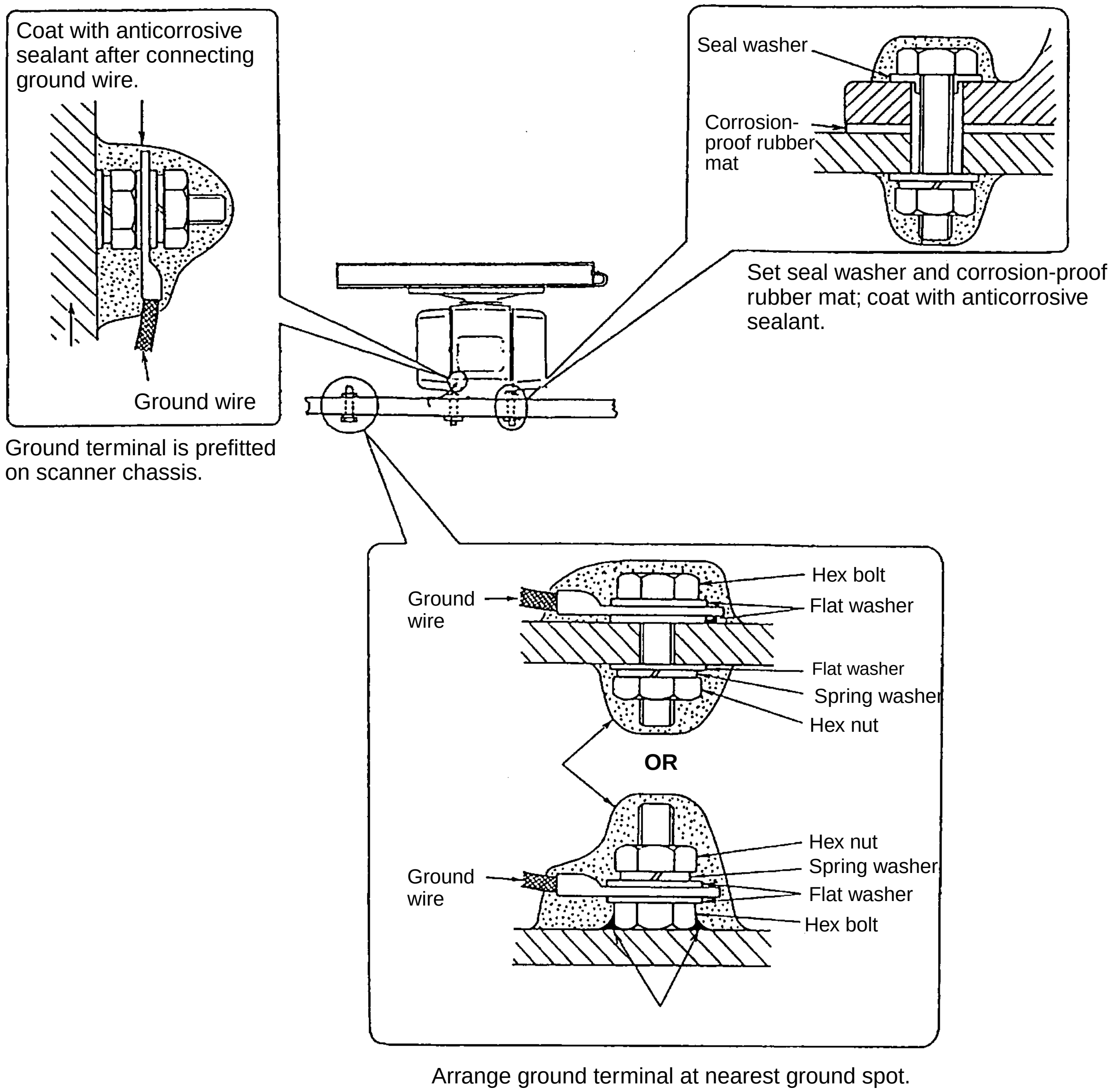


Figure 1-3 Mounting of scanner unit

1.2 Display Unit

Before mounting the display unit

If Gyro Converter GC-8 (option) is to be used, install and setup the GYRO CONVERTER Board before mounting the display unit, because of the difficulty involved in doing it after the display unit is installed. Instructions for installation and setup are in Chapter 4.

Mounting considerations

When selecting a mounting location, keep in mind the following points:

- Select a location where the display unit can be viewed and operated conveniently and where the screen can be viewed while facing towards the bow.
- Locate the unit out of direct sunlight and away from heat sources because of heat that can build up inside the cabinet.
- Locate the equipment away from places subject to water splash and rain.
- The display unit is very heavy. Be sure the mounting location is strong enough to support the weight of the unit under the continued vibration which is normally experienced on the ship. If necessary reinforce the mounting location.
- Determine the mounting location considering the length of the signal cable between the scanner unit and the display unit and the power cable between the display unit and Power Supply Unit PSU-004.
- Leave sufficient space on the sides and rear of the unit to facilitate maintenance. Also, leave a foot or so of “service loop” in cables behind the unit so it can be pulled forward for servicing or easy removal of connectors.
- A magnetic compass will be affected if placed too close to the display unit. Observe the following compass safe distances to prevent deviation of a magnetic compass: Standard compass, 1.70 m, Steering compass, 0.90 m.

Mounting procedure

Tabletop mounting

This procedure requires two people to complete.

1. Make four holes of 12 mm diameter in the mounting location referring to the outline drawing at the end of this manual.
2. Unfasten the screws fixing the right and left brackets on the control head.
3. Unfasten bolts (four total) in the brackets.

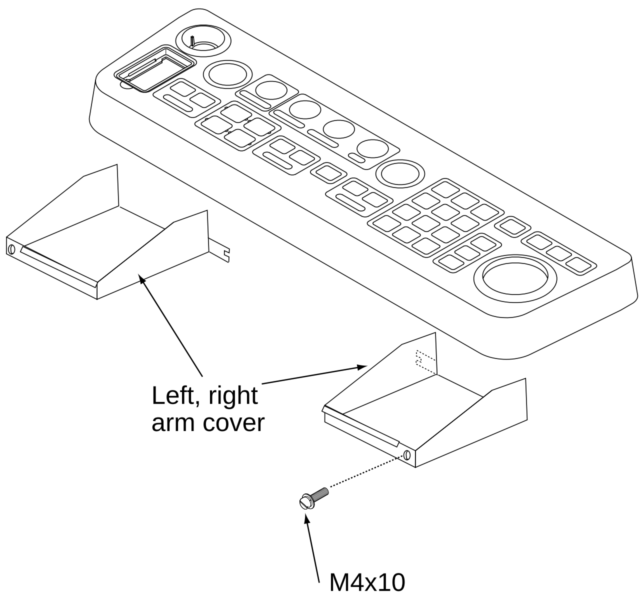


Figure 1-4 Control head

4. While one person is holding the mounting base at the sides, pull the handle on the underside of the control head to draw the display unit toward you until you hear a click.

⚠ CAUTION

Use two people to complete this step.

The display unit may fall to the deck when it is pulled forward, since the mounting base is not yet fastened to the mounting location.

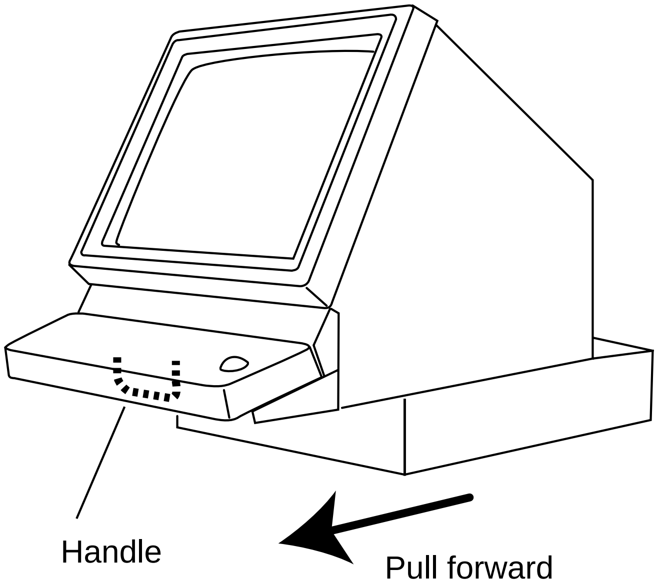


Figure 1-5 Display unit

5. This step requires two people to complete. While raising the monitor until the CRT is horizontal, fix the stay as follows:

   a) Raise the stay as shown below.

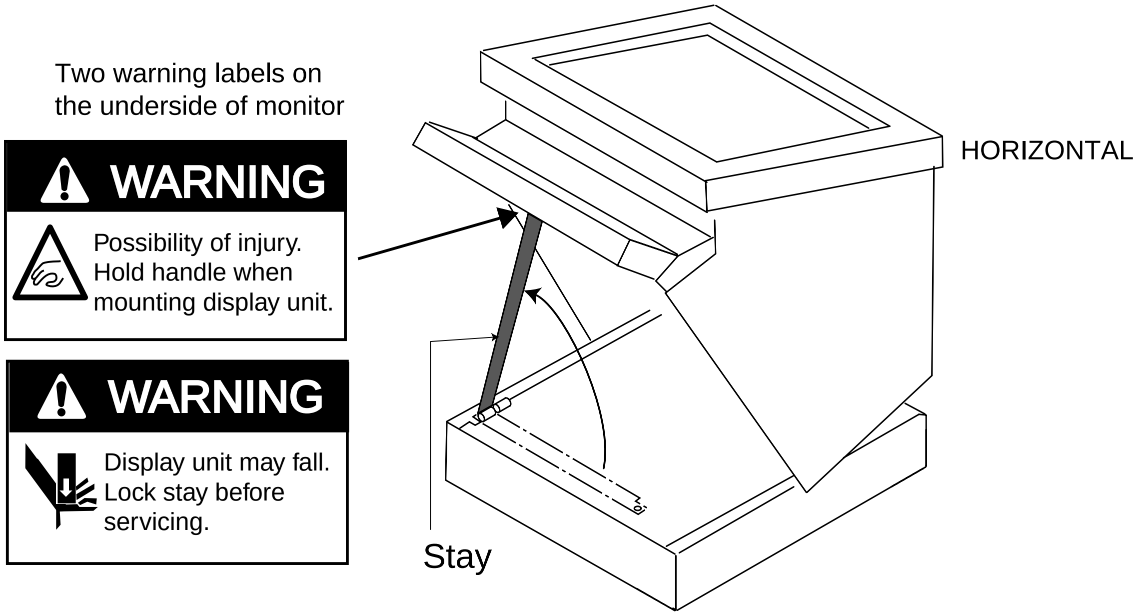


Figure 1-6 Display unit, inside view

b) While pushing the stopper, set the catch on the display unit in the hole at the front edge of the stay.

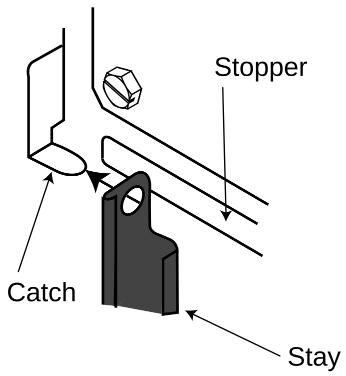


Figure 1-7 Setting catch to hole in stay

c) Release hand from stopper.

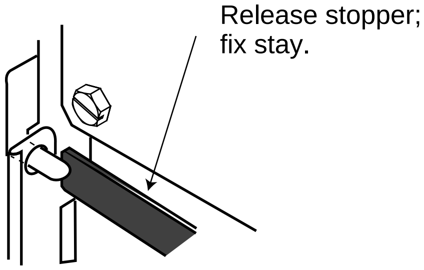


Figure 1-8 Stay fixed

6. Fasten the display unit to the mounting location at front fixing holes (2 points) with M10 bolts, nuts and flat washers, using the pipe box spanner (supplied).

   You cannot fasten the display unit at the rear fixing holes while the monitor is raised.

7. Retract the stay and lower the monitor.
8. Fasten the display unit to the mounting locations at rear fixing holes (2 points) with M10 bolts, nuts and flat washers, using the pipe box spanner (supplied).

   The rear left hole is hid under the PTU cover. Remove the cover as follows:

   (1) Unfasten five M3x8 screws at the top of the PTU cover and two M4x8 screws at the front of the cover to slide the cover toward the front side.

   (2) Remove the cover by grasping the knob on the top of the cover.

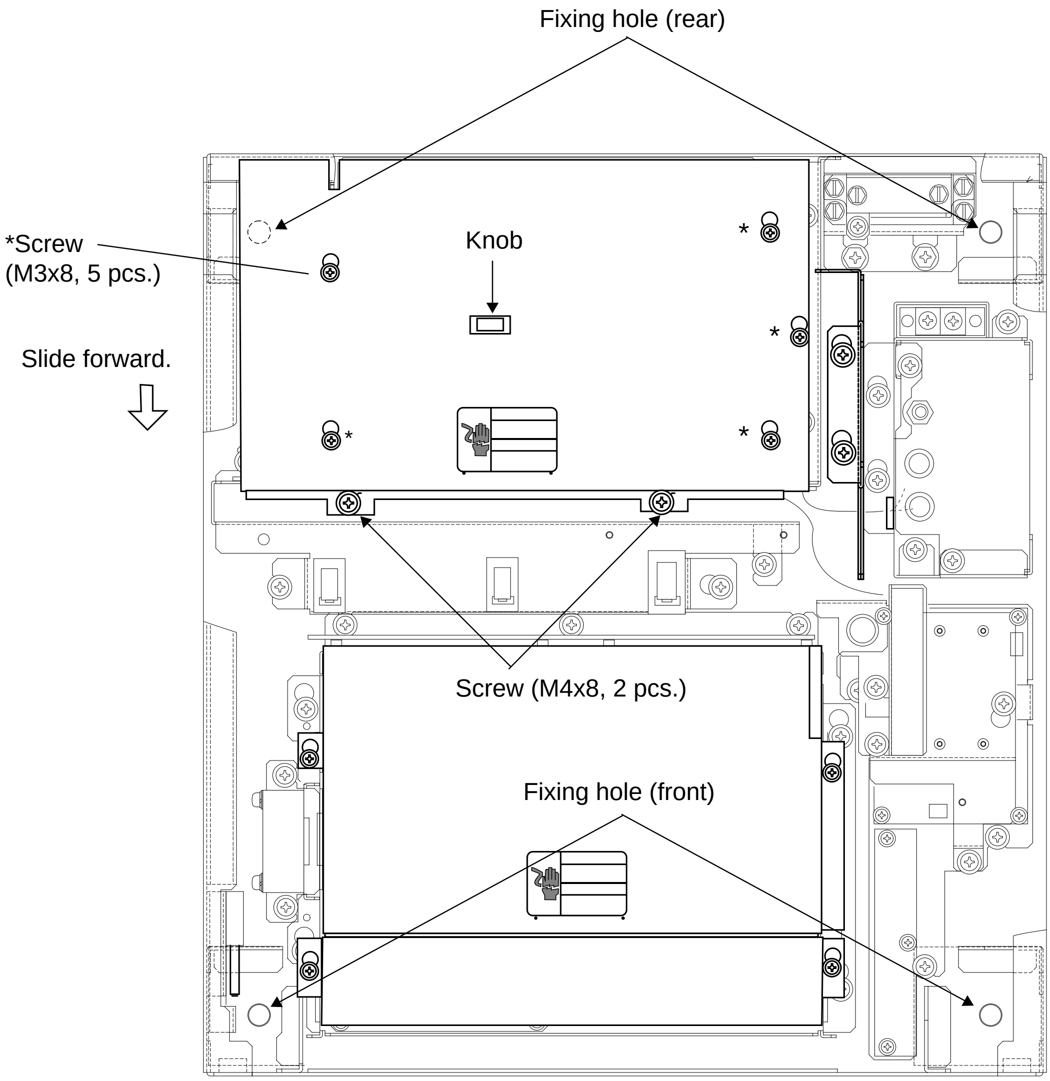


Figure 1-9 How to remove the PTU cover

9. Push the monitor forward until you hear a click.
10. Fix the brackets with the M10 bolts removed at step 3.

Console type mounting

1. Make six holes of 15 mm diameter and a cable entrance hole through the deck referring to the outline drawing at end of this manual.
2. Open the front cover.
3. Fix the equipment with M12 bolts, nuts and washers.
4. Hoist the console to the deck by using the eye bolts attached to the console. Remove the eye bolts and set the cosmetic caps with washers to the eye bolt holes.

Separating the control head

The control head connects to the display unit with a connection cable, thus it can be located where desired, using the separate control head kit (option). Follow the procedure on the next page to separate the control head from the display unit.

Separate Control Head Kit (Type: OP03-151, No.: 008-485-530)

Name	Type	Qty	Code No.	Remarks
Cable Assy.	UL246SB20P/1P	1	000-140-812	10m, 03S9422
Handle	A-1042-C-4	1	000-800-986	
Rubber Feet	SJ-5003	4	000-801-787	W/tape
Monitor Front Cover	03-144-1361	1	100-263-340	
KB Fixing Plate	03-144-1691	1	100-263-940	
Handole Plate	03-144-1632	1	100-268-040	

Display unit modification procedure

1. Raise the monitor unit following to procedure for tabletop mounting on page 1-6.
2. Unplug two connectors from the control head cable (P412 from MOTHER Board and J583) and unfasten two earth wires.

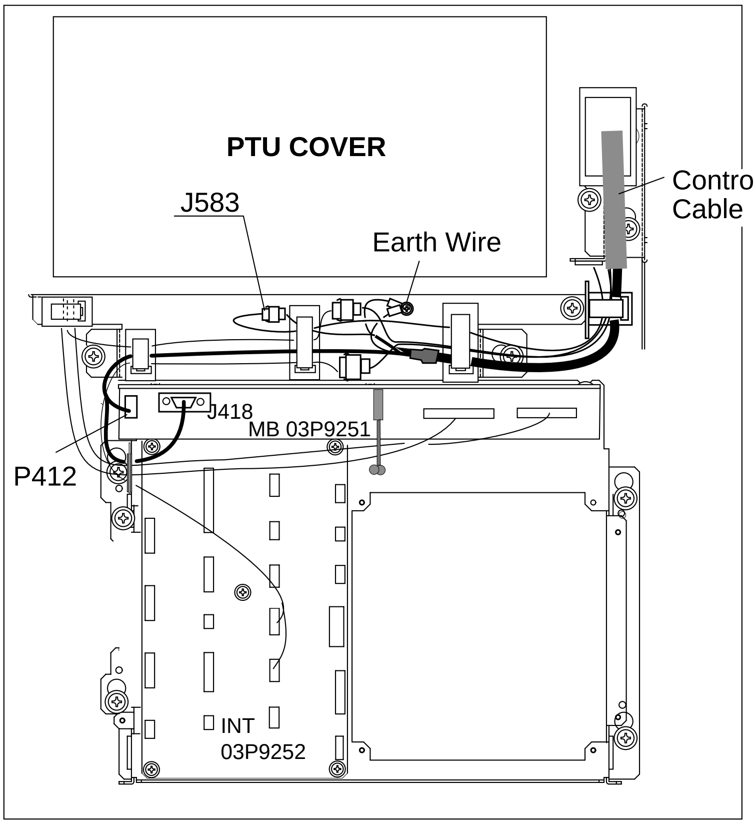


Figure 1-13 Display unit, inside view

3. Lower the monitor.
4. Unfasten the M4 screw fixing the ground terminal of the connection cable.
5. Push the monitor forward until you hear a click.
6. Unscrew four screws fixing the top cover of the display unit.
7. Remove three clamps fixing the connection cable in the monitor unit.

8. Unfasten four screws fixing the right and left brackets on the control head.
9. Unfasten four screws fixing the right and left covers on the display unit.
10. Unfasten six screws fixing the right and left KB arms.
11. Unfasten three screws fixing the panel cover.

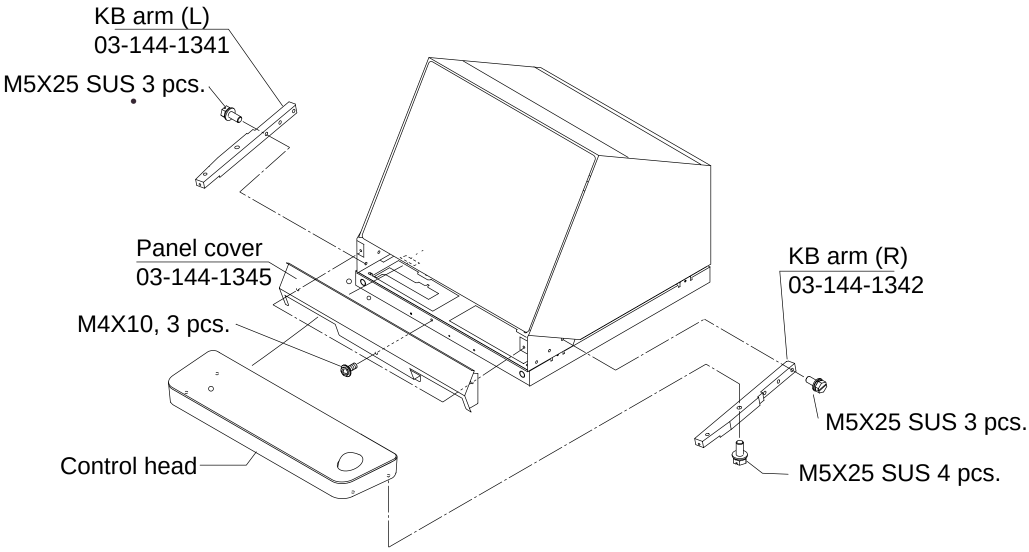


Figure 1-14 Removing the control head

Control head modification procedure

1. Unfasten eight screws (M4X8) on the underside of the control head. Unplug connectors P314, P312 and P317 from the control head. Separate the KB bottom plate from the control head.
2. Unfasten the screw (M4) fixing the ground terminal and two screws (M4X8) fixing the clamp. Remove the connection cable assy.
3. Unfasten two screws (M6X12) from the inside of the bottom plate of the control head to dismount the handle.
4. Replace the cable assy. with cable assy. UL2464SB2-0P/1P (10 m, supplied) as below and reassemble the control head.

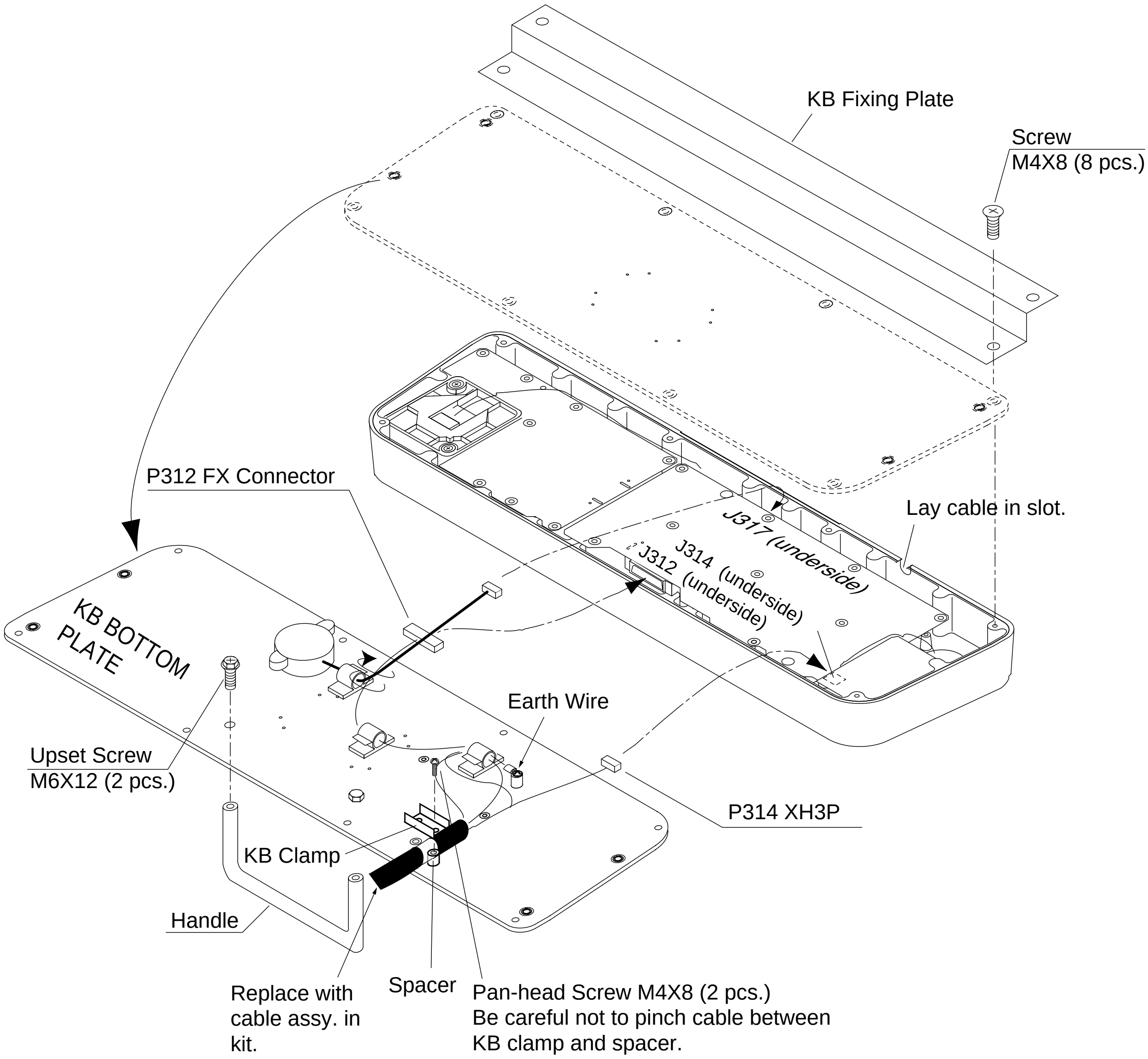


Figure 1-15 Control head

Connection of display unit to control head

1. Attach the handle to the handle plate, using the screws for the handle and bottom cover of the control head.
2. Attach the handle plate to location where the KB arms were fastened.
3. Pull the monitor toward you until you hear click.
4. Lead in the cable assy. (option) from the rear entrance of the display unit. See Chapter 2.
5. Raise the monitor and fix the stay.
6. Inside the display unit, fasten ground wire of the cable assembly with an M4 screw on the chassis.
7. Plug in two connectors of connection cable (P412, J583: See illustration on the previous page.)

8. Lower the monitor.
9. Attach the monitor front cover (option) to the place the panel cover have been, using the screw for the panel cover.
10. Attach rubber to feet to the bottom of the keyboard if the keyboard is not going to be permanently fixed. To fix the keyboard to a desired location, fasten the KB fixing plate to the keyboard and desired location with two upset screws (M5X25, formerly used to fasten KB arms) and two tapping screws (ϕ6.5, local supply) as below.

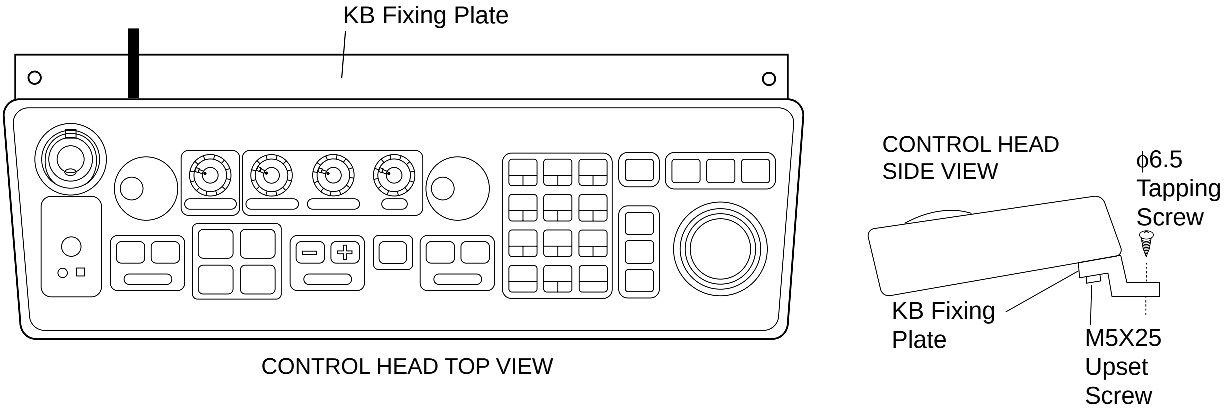


Figure 1-15 How to attach KB fixing plate

11. Set dust cover KB (supplied) on the control head.

Attachment of hood

1. Set two spacers (supplied) to the lower two of the four M5 holes in the CRT panel.
2. Screw two screws (supplied) into the holes in the hood.
3. Set the bottom of the hood to the screws at the bottom of the CRT panel, and then fasten the two screws at the top of the hood to the CRT panel.

1.3 Power Supply Units

The Power Supply Unit PSU-001 (for scanner unit) and PSU-004 (for display unit) do not contain usual operating controls. Therefore, they can be installed in any recessed place either in vertical or horizontal position. (For the console mount display unit, the PSU-004 may be installed inside the console.) However, select a dry and well-ventilated location and observe the minimum compass safe distances below to prevent deviation of a magnetic compass.

	Standard compass	**Steering compass**
PSU-001 (for scanner unit)	1.20 m	0.90 m
PSU-004 (for display unit)	0.50 m	0.30 m

WIRING

2.1 Scanner Unit

Preparations

Open the port side cover of the scanner unit to access terminal boards.

Fabricating signal cable S03-80

1. Shorten the cable, extending the length actually required by 800 mm. Strip off about 600 mm of the anti-corrosive vinyl sheath, and 790 mm of the armor and the inner vinyl sheath, being careful not to nick the braided shield.

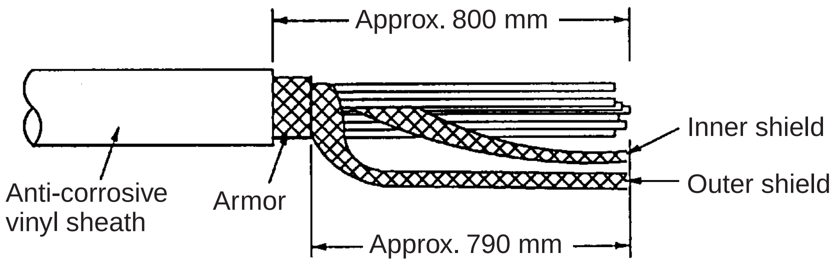


Figure 2-1 Fabricating the signal cable S03-80

2. Unravel the outer shield with a screwdriver or similar tool to expose the cores beneath the outer shield.
3. Similar to step 2, expose the cores beneath the inner shield. Mark all cores for future identification.
4. Slide the clamping gland, washers and gasket onto the cable. (Use lower side gland.)

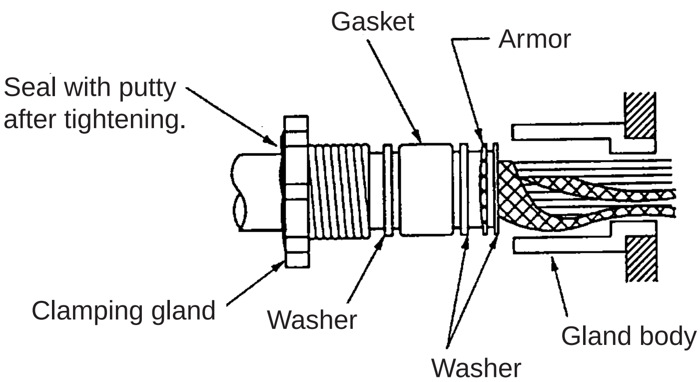


Figure 2-2 Passing clamping gland, washers and gasket on signal cable

5. Ground the armor through the two washers as shown above. Trim the shields considering their location on the earth terminal inside the scanner unit. Fit a crimp-on lug (yellow, FV5.5-4, ø4) to inner and outer shields, then connect them to the ground terminal inside the scanner unit.

6. Determine the length of each core considering its location on STB-1 in the scanner unit (see the interconnection diagram on page S-1). Remove approx. 6 mm of the vinyl insulation from the end of each core and fix the crimp-on lug FV1.25-M3 (Red) to each core.

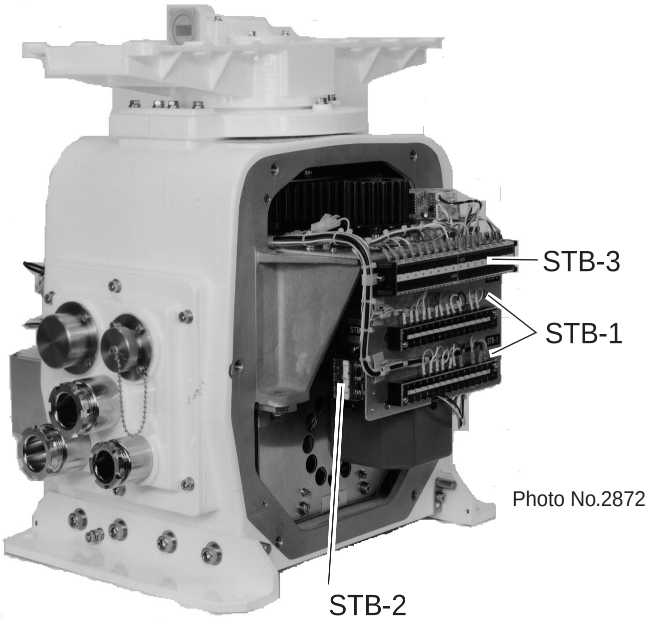


Figure 2-3 Scanner unit, cover opened

7. Remove the outer sheath of the coaxial cable (2C-2V) by 75 mm. Pull back the braided shield to expose the inner core. Remove approx. 25 mm of insulator from the end of inner core and fold back conductor as illustrated below. Shorten the shield leaving approx. 45 mm. Fit crimp-on lugs to the conductor (FVD1.25-3, Red) and braided shield (FV1.25-M3, Red).

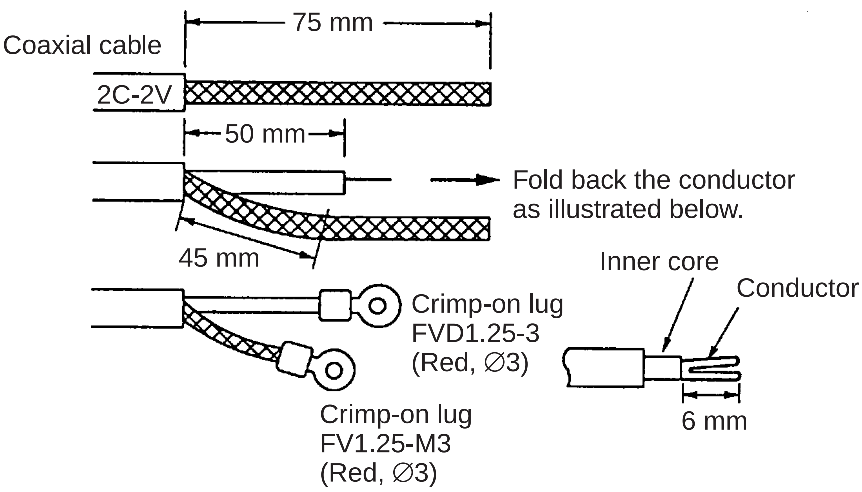


Figure 2-4 Fabrication of coaxial cable

8. Slip the cable gland over the cable and tighten the cable gland nut. Seal the cable gland nut with putty to preserve watertight integrity.

9. Connect wiring to terminal STB-1 referring to the interconnection diagram.

Fabricating signal cable 250V-MPYCY-16 (JIS cable)

1. Unfasten the clamping gland from the upper cable gland, and remove the gasket and flat washers.
2. Shorten the cable as appropriate. Remove the vinyl sheath by 600 mm. Remove the armor by 590 mm.

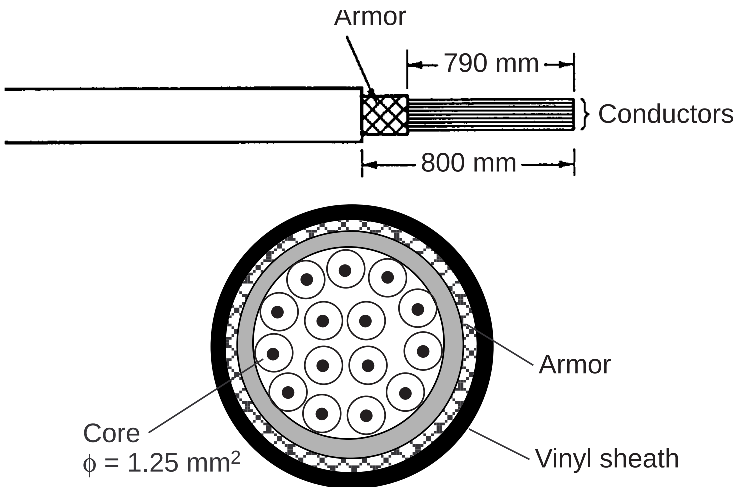


Figure 2-5 Fabrication of signal cable 250V-MPYCY-16

3. Slide the clamping gland, washers and gasket on the power cable. Fold back the armor by 5 mm, then put it between washer and cable gland body as below.

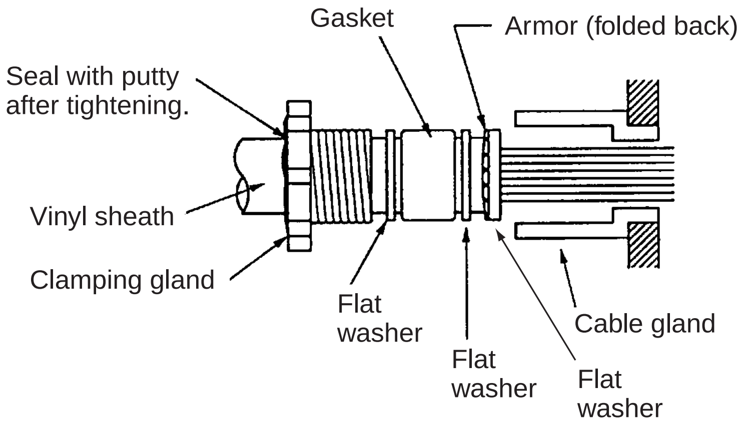


Figure 2-6 Passing clamping gland, washers and gasket on the signal cable

4. Determine the length of the cores considering their location on STB-2 and STB-3. Trim conductors as necessary.
5. Ground the armor by inserting it through the two flat washers near the cable gland.
6. Remove the sheath of each core by 6 mm. Fix crimp-on lugs (FV1.25-4, blue, ø4) to each conductor. Make sure each connection is secure both electrically and mechanically.

7. Secure the clamping gland to the cable gland body; then seal with putty.
8. Connect the conductors to STB-2 and STB-3, referring to the interconnection diagram on page S-1.
9. Check for loose screws, poor contact on crimp-on lugs, etc. Close the terminal boards.

When the de-icer is installed

1) Before beginning any work on the scanner unit, turn off the breaker for the de-icer line at the main switchboard to remove the power (100 VAC, 1ø) to the de-icer. (Turning off the power to the display unit has no effect.)
2) The neck of the scanner unit becomes VERY HOT when the de-icer is working. (The de-icer turns on when ambient temperature is below 0°C.)

Fixing the scanner cover

Before closing the cover check for loose screws and poor contact on crimp-on lugs. Grease fixing bolts for cover, gasket and tap holes in scanner chassis. Attach cover.

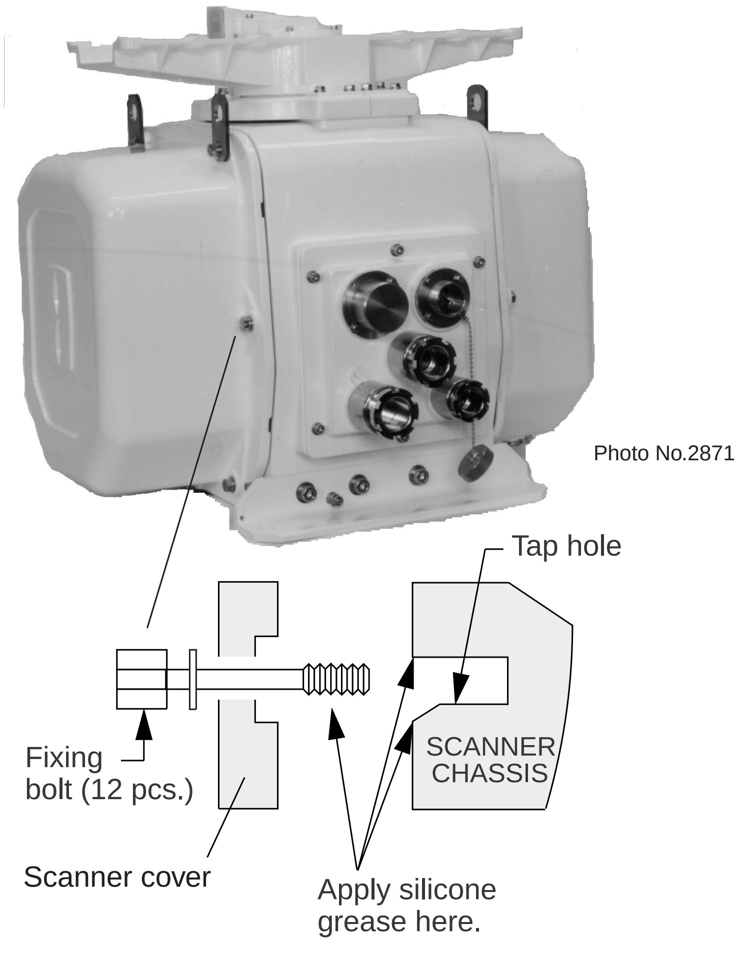


Figure 2-7 Scanner unit, side view

2.2 Display Unit

Two cables are terminated at the display unit: the signal cable S03-80 and the power supply cable from the Power Supply Unit PSU-004.

Fabricate the power cable as below.

Fabricating the power cable DPYCY-3.5

DPYCY-3.5 is a Japan Industry Standard Cable; use equivalent.

1. Remove the vinyl sheath by 80 mm.
2. Cut off jute tape wrapped around the armor.
3. Unravel the armor to expose the cores by about 35 mm.
4. Remove insulation of cores by about 10 mm. Fix crimp-on lugs to the cores and armor.
5. Cover the armor with vinyl tape, leaving the portion which will lie inside the cable clamp untaped.

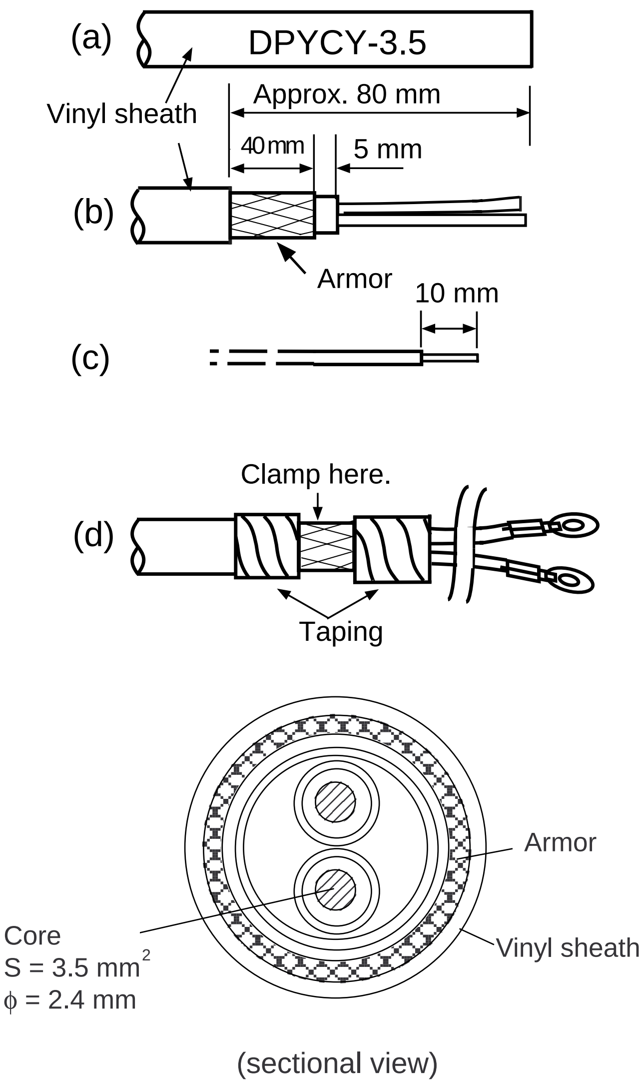


Figure 2-8 Fabricating power cable DPYCY-3.5

Leading in cables to the display unit

The cable clamp may be positioned within the display unit (default arrangement), outside the display unit. When the cable clamp is located outside the display unit, use the bottom clamp front plate and bottom clamp rear plate (supplied with installation materials).

Also, use the shielding foam (supplied) to protect the noise radiation.

Cable fed from back of display unit (default)

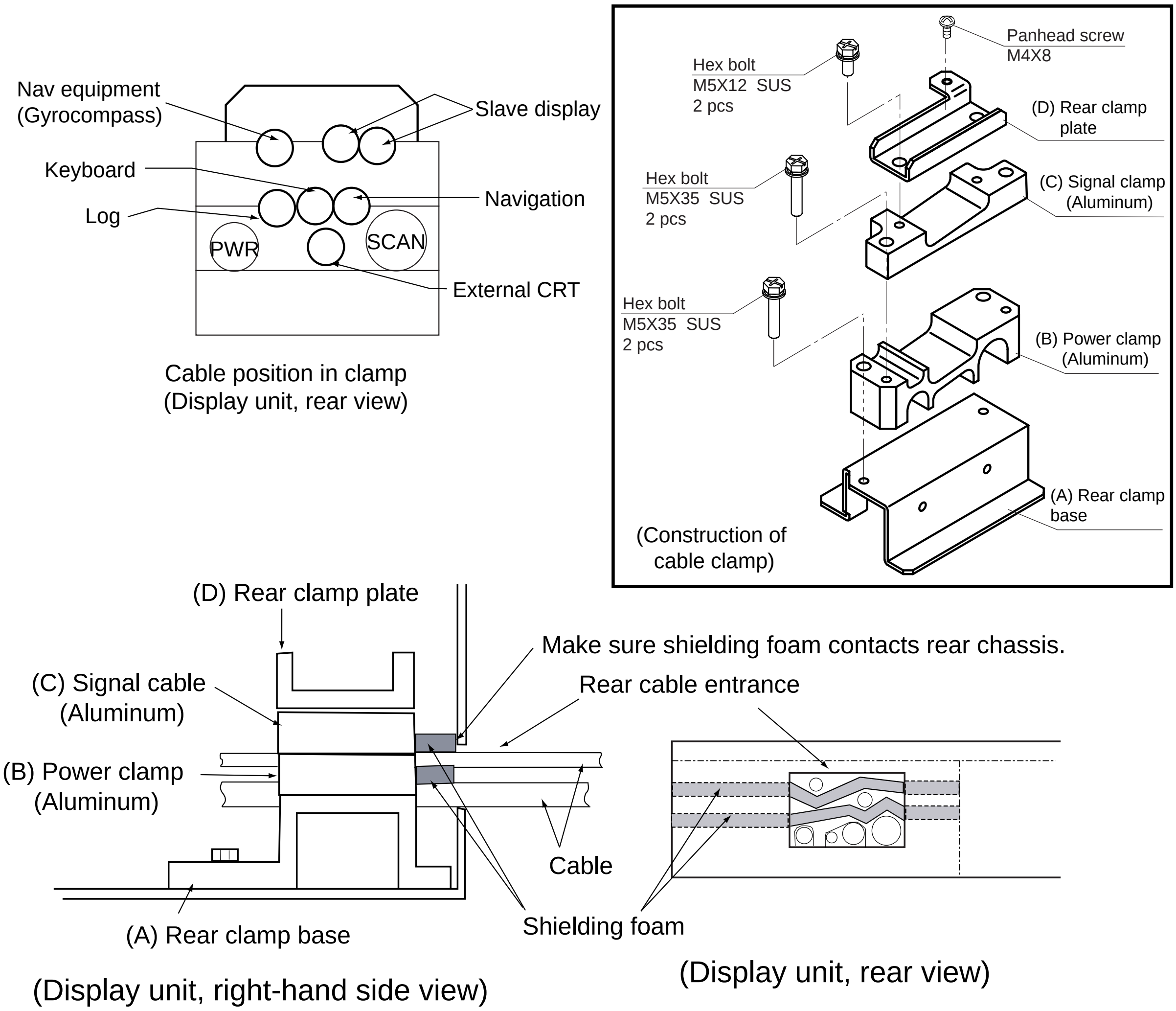


Figure 2-9 Default cable clamp position

- Place shielding foam between cables, and then attach foam to aluminum clamps.
- Fill unused clamp holes with shielding foam.

Cable fed from outside display unit

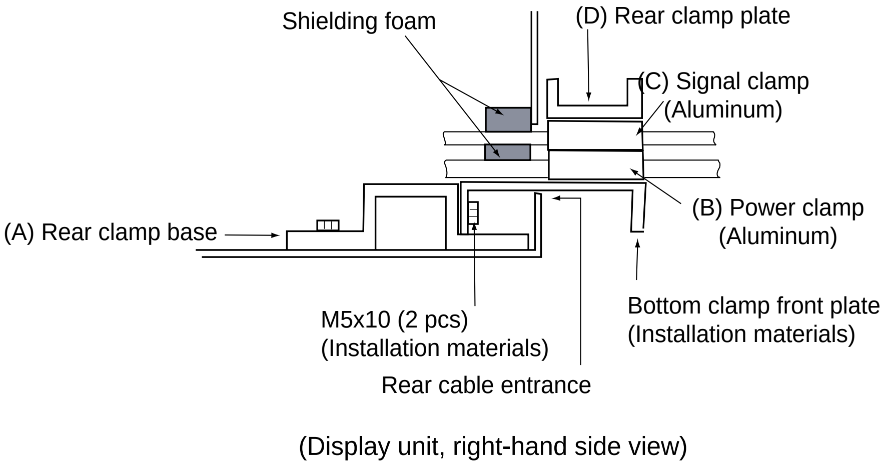


Figure 2-10 Clamp position outside display unit

- Place shielding foam between cables inside of display unit, and then attach foam to chassis.
- Fill unused clamp holes with shielding foam.

Cables fed from bottom of display unit

Lead in cables through the cable clamp at the rear of the console and ground their shields in the cable clamp. For signal cable, remove vinyl sheath where cable lies in cable clamp. Fasten cables with cable ties.

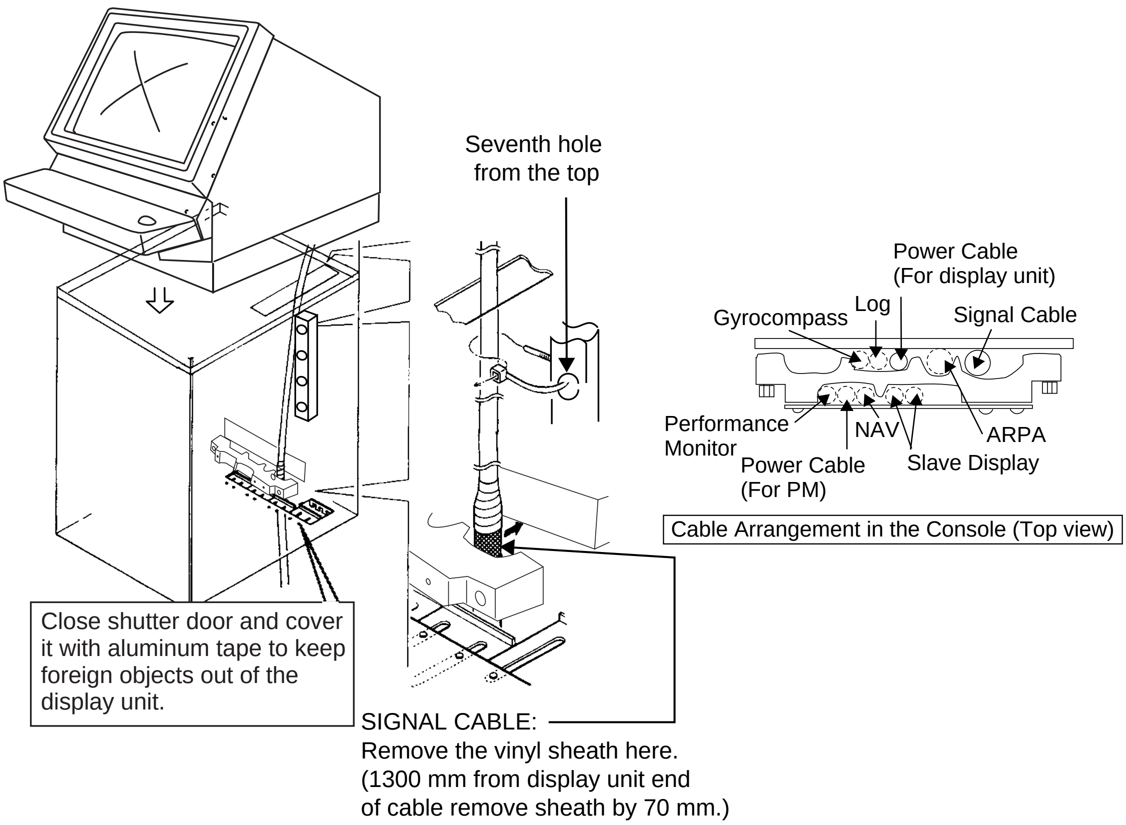
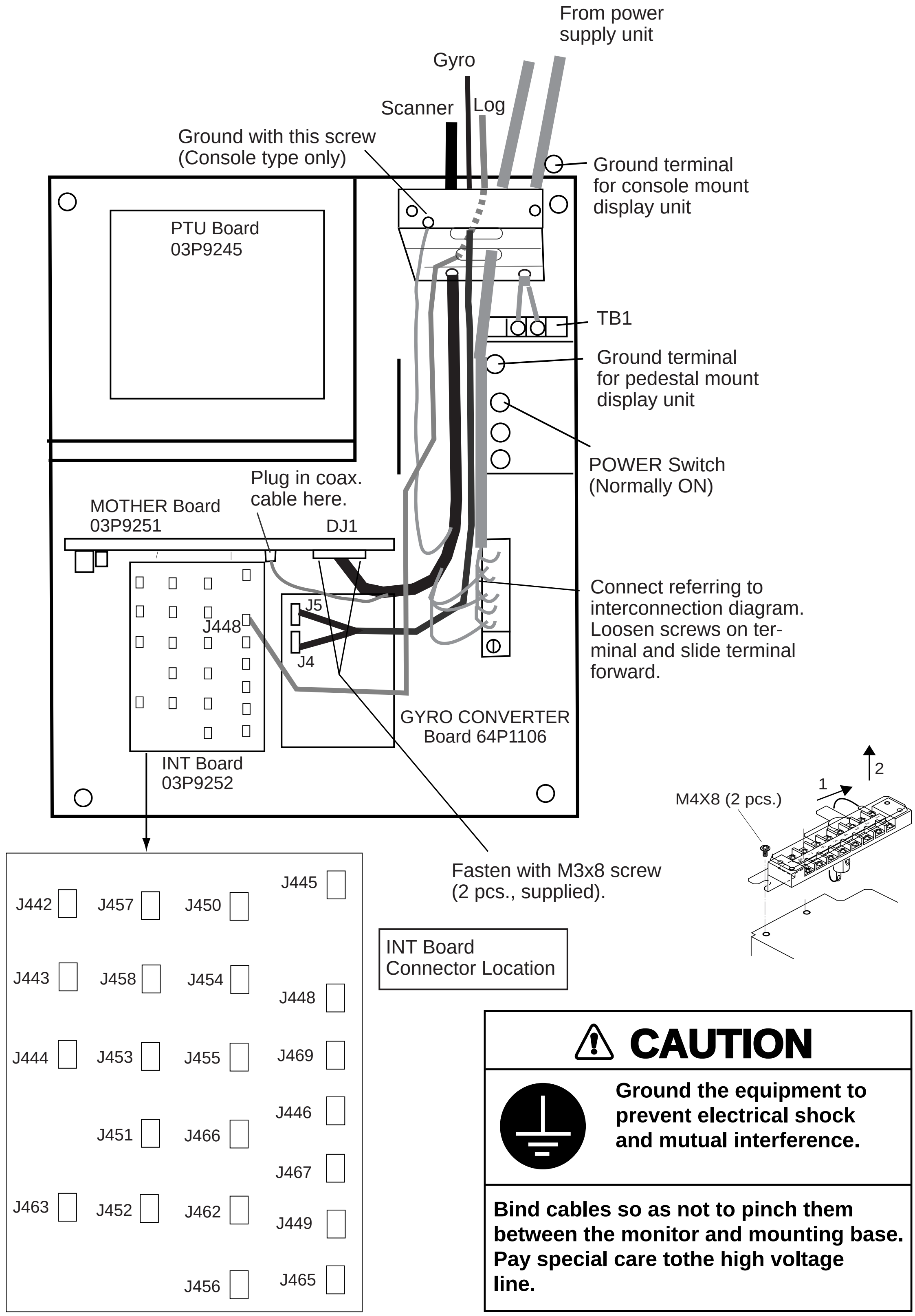


Figure 2-11 Clamp position at bottom of display unit

Connections

Open the display unit and fix it with the stay. (For procedure see page 1-6.) Remove the shield cover from the INT Board. Connect signal, power, gyro and log cables as shown on the next page. Optional equipment are connected to the INT Board. Be sure to ground the display unit.



⚠ CAUTION

Ground the equipment to prevent electrical shock and mutual interference.

Bind cables so as not to pinch them between the monitor and mounting base. Pay special care tothe high voltage line.

Figure 2-12 Display unit, inside view

Connectors on the INT Board

Table 2-1 Connectors on the INT Board

Signal name	Name on pcb	Connector no.	Connector type	Applicable equipment	Remarks
Input Signal					
Gyro signal		J4	VH, 3 pin		*: On pcb A64P1106 (option)
		J5	VH, 5 pin		
Speed log signal	LOG	J448	NH, 3 pin		200 pulses/nm, etc.
Radar buoy signal	RADAR BUOY	J445	NH, 4 pin		
Remote display signal	EXT-RADAR or RJ-7	J458	NH, 8 pin		
Output Signal					
External ARPA signal	EXT-ARPA	J444	NH, 8 pin		Heading, bearing, Tx trigger
Slave display signal	SLAVE	J442 J443	NH, 8 pin	CD-140, CD-141, GD-500, GD-500MK2, FMD-800, FMD-8010 *1 *1: Display unit for FR-2105 series radar can be used as slave display unit.	Heading, bearing, video, Tx trigger
Buzzer signal	EXT-BUZ	J451	NH, 9 pin	Speaker w/amp	Speaker signal
Monitor signal		J449	NH, 10 pin		VER synchronous, HOR synchronous, video (NTSC format)
RS-232C	RS-232C	J456	NH, 4 pin		
Analog	ANALOG	J453	NH, 3 pin		
External buzzer	EXT ALARM (AC)	J452	NH, 3 pin		
Input/Output Signal					
INS data	INS. DATA	J455	NH, 5 pin		
RJ-7	RJ-7	J457	NH, 15 pin		
RJ-8	RJ-8	J416	NH, 4 pin		On Mother Board 03P9251
Nav data	NAV DATA	J450	NH, 5 pin		
ARPA data	ARPA DATA	J454	NH, 5 pin		
PM_ON_OFF	PM_PINT	J411	XH, 3 pin		On Mother Board 03P9251

Note: How to attach NH connector is shown on the next page.

How to attach NH connector

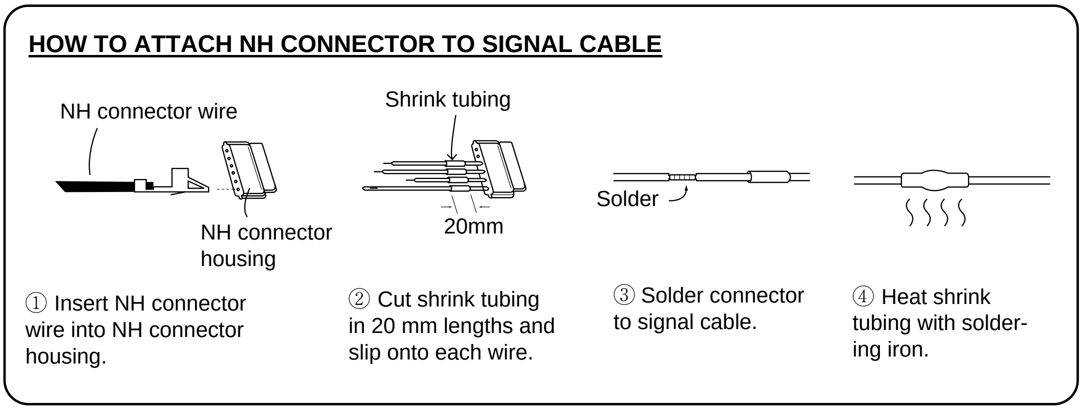


Figure 2-13 How to attach NH connector

2.3 Changing AC Power Specification of Display Unit

For 100 VAC or 220 VAC power, add or delete jumper wires on the PTU Board and change the power fuses inside the display unit as shown in the table below according to ship's mains. The figure on below shows the location of the power fuses and the jumper wires on the PTU Board.

Table 2-2 Jumper wire setting on the PTU board, fuse rating and power specification

PCB	Power Spec.	Antenna rpm	JP1	JP2	JP3	JP4	JP91	JP92	Power Fuses
03P9245A	100/110/115 VAC	24 rpm	YES	YES	YES	NO	NO	NO	10A
03P9245D	220/230 VAC	24 rpm	NO	NO	NO	YES	NO	NO	5A

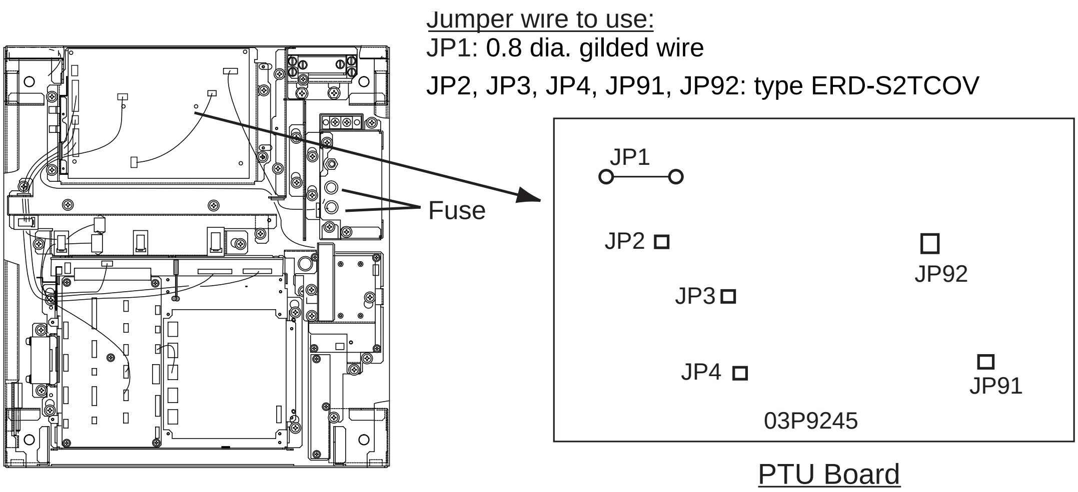


Figure 2-14 Display unit, inside view

2.4 Power Supply Units

Power supply unit PSU-004

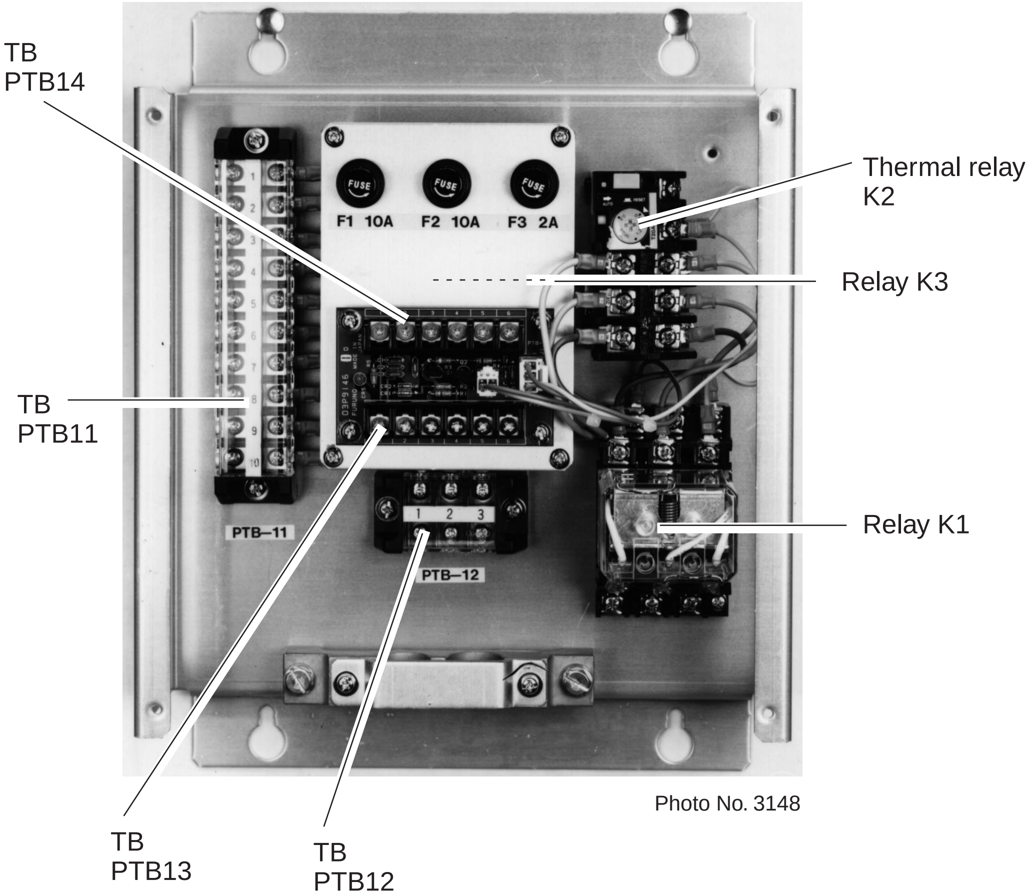


Figure 2-15 Power supply unit PSU-004

The table below lists the type of thermal relay used in the PSU-004. The type of the relay and its presetting differs according to ship's mains.

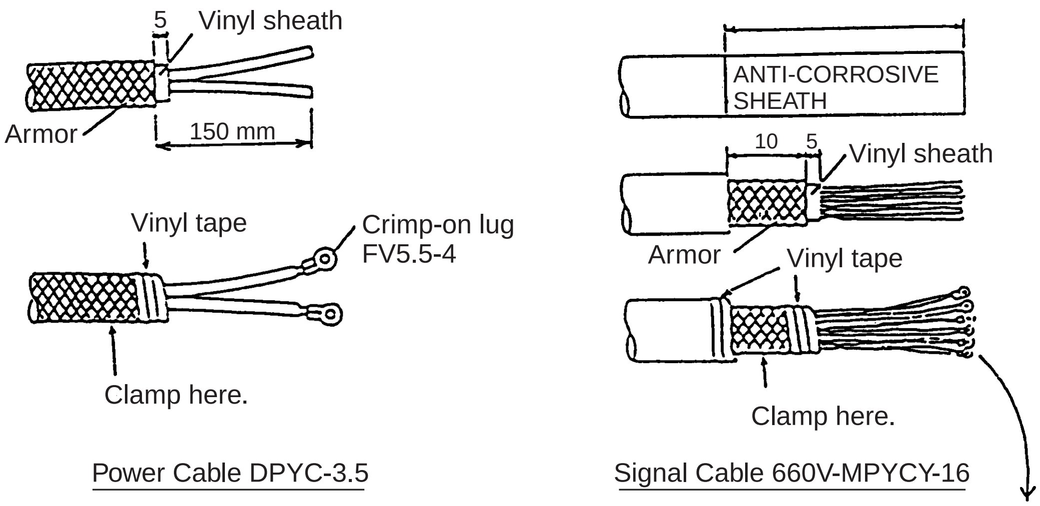
Table 2-3 Thermal relay in power control unit PSU-004

Ship's Mains	**Scanner Unit**	**Thermal Relay (K2)**	
		Type	**Rating**
24 VDC	RSB-0051	BAC101505D	5A

Fabricate the power supply cable as shown on page 2-5.

Power supply unit PSU-001

Two cables run to the Power Supply Unit PSU-001, the power cable (DPYCY-3.5) and the signal cable (660V-MPYCY-16). The figure below shows the location of the terminal boards inside the PSU-001. Wire the unit as shown in the interconnection diagram.



Core No.	Connected to	Crimp-on Lug
1 to 9	PTB2	FV1.25-M3 (Red)
10 to 16	PTB1	FV2-4 (Blue)

Figure 2-16 Fabrication of power cable and signal cable

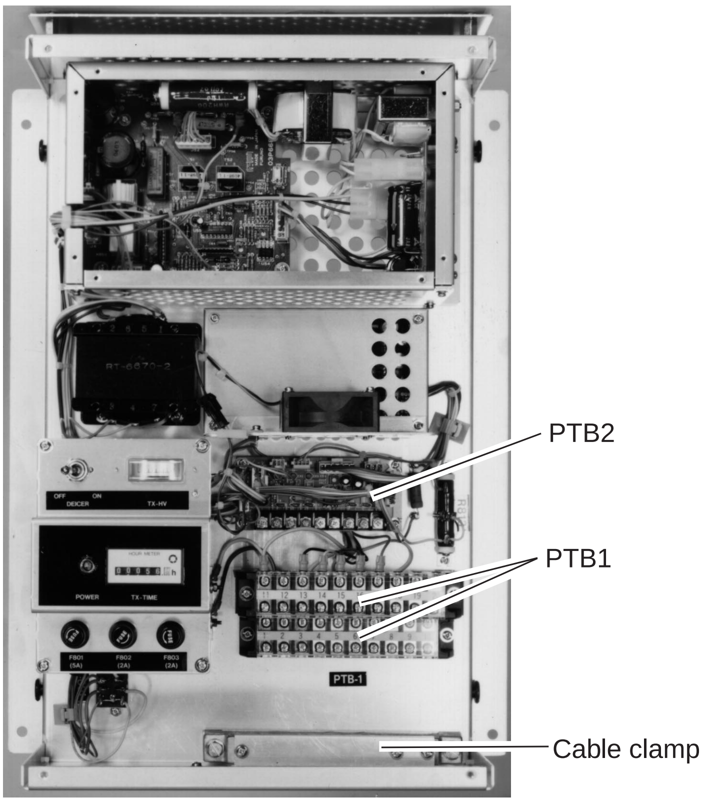


Figure 2-17 Power supply unit PSU-001

INITIALIZATION AND ADJUSTMENT

3.1 Tuning Initialization

Tune the radar as follows: Press [RADAR MENU] [0] [0] [2] [0] [0] [0] [0] (TUNE INITIALIZE on RADAR 3 menu) and press the [ENT] key.

3.2 Accessing Menus for Initialization and Adjustment

To access them do the following:

1. Turn on the power.
2. Press the [RADAR MENU] key five times while pressing and holding down the [HL OFF] key.

Restoring default settings

1. Press [RADAR MENU] [0] [0] [0] [2] [0] [0] [0] to display the INITIAL SETTING 4 menu.
2. Press the [0] key to select FACTORY DEFAULT.
3. Press the [ENTER] key five times, and turn the power off and on again.
4. “Initializing” appears during restoring. It takes about 90 seconds to restore the default settings, after which the normal display appears. Confirm that “2.MODEL” is set to “OTHER X-BND” on the INITIAL SETTING 4 menu.

3.3 Adjusting Video Signal Level

When the signal cable is very long, the video amplifier input level decreases, shrinking target echoes. To prevent this, confirm (and adjust if necessary) video amplifier input level.

1. Connect an oscilloscope to TP6 on the INT Board (03P9252) in the display unit.
2. Transmit on the 12 nm range.
3. Adjust R21 on the INT Board so the value of TP6 is 4 Vpp. (For remote display, adjust R134 on the INT Board.)

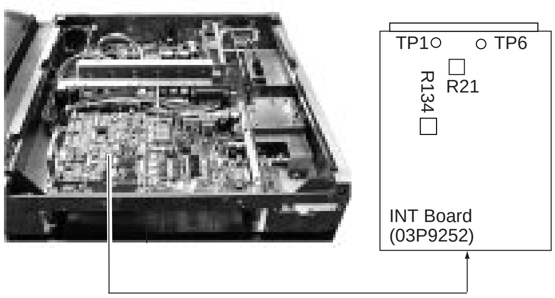


Figure 3-1 Display pedestal

3.4 Heading Alignment

You have mounted the scanner unit facing straight ahead in the direction of the bow. Therefore, a small but conspicuous target dead ahead visually should appear on the heading line (zero degrees).

In practice, you will probably observe some small bearing error on the display because of the difficulty in achieving accurate initial positioning of the scanner unit. The following adjustment will compensate for this error.

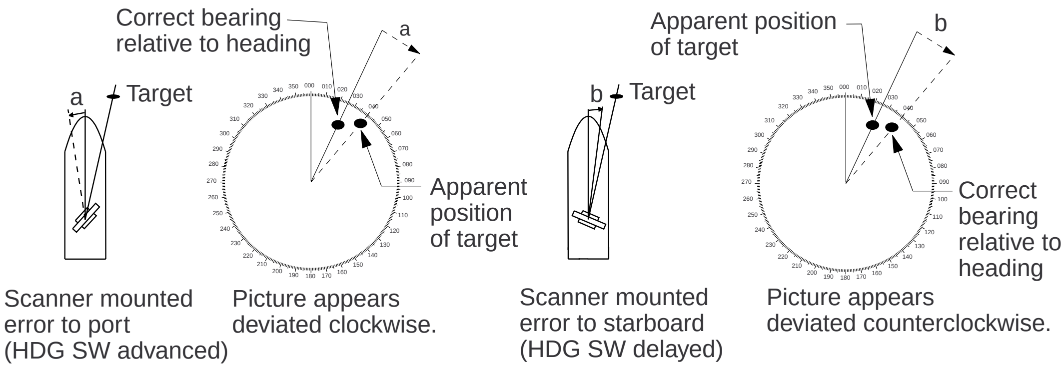


Figure 3-2 Heading alignment

1. Turn on the power. Press [RADAR MENU] [0] [0] [0] [2] [2] to select HL ALIGN on the INITIAL SETTING1 menu.
2. Select a target echo (by gyrocompass, for example) at a range between 0.125 and 0.25 nm, preferably near the heading line.
3. Operate the EBL control to bisect the target echo with the heading line. (The value shown on the display is scanner position in relation to ship's bow.)
4. Press [ENTER] to finish.

3.5 Adjusting Sweep Timing

Sweep timing differs with respect to the length of the signal cable between the scanner unit and the display unit. Adjust sweep timing at installation to prevent the following symptoms:

- The echo of a "straight" target (for example, pier), on the 0.25 nm range, will appear on the display as being pulled inward or pushed outward. See Figure 3-3.
- The range of target echoes will also be incorrectly shown.

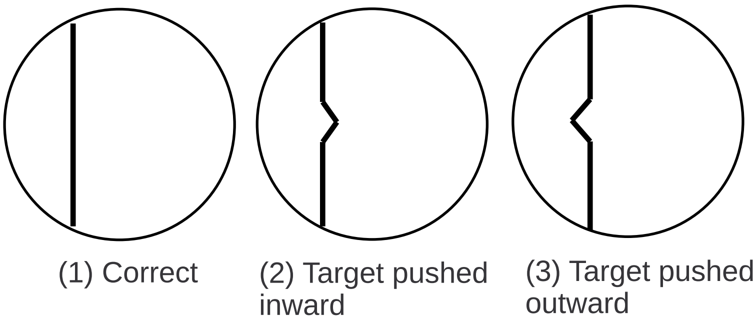


Figure 3-3 Examples of correct and incorrect sweep timings

1. Turn on the power. Press [RADAR MENU] [0] [0] [0] [2] [3] to select TIMING ADJ on the INITIAL SETTING1 menu.
2. Transmit on the 0.25 nm range.
3. Adjust radar picture controls to display picture properly.
4. Select a target echo which should be displayed straightly.
5. Adjust the VRM control to straighten the target echo.
6. Press [ENTER].

3.6 Suppressing Main Bang

If main bang appears at the screen center, suppress it as follows.

1. Turn on the power. Transmit on a long range and then wait ten minutes.
2. Adjust [GAIN] control to show a slight amount of noise on the display.
3. Select the 0.25 nm range. Adjust the [A/C SEA] control to suppress sea clutter.
4. Press [RADAR MENU] [0] [0] [0] [2] to open the INITIAL SETTING1 menu.
5. Press [7] to select 7. MBS.
6. Adjust the VRM control to adjust timing; the EBL control to adjust level.
7. Press [ENTER].

3.7 Confirming Magnetron Heater Voltage

Magnetron heater voltage is adjusted at the factory using a 15 m signal cable. Therefore, when the length of the cable is other than 15 m, confirm that magnetron heater voltage is within the prescribed rating as follows:

1. Turn on the radar and press [RADAR MENU] [0] [0] [0] [2] [0] to open the INITIAL SETTING2 menu.
2. Press [5] to select the 5. SCANNER STOPPED field and the TX option.
3. Turn off the antenna switch in the display unit.

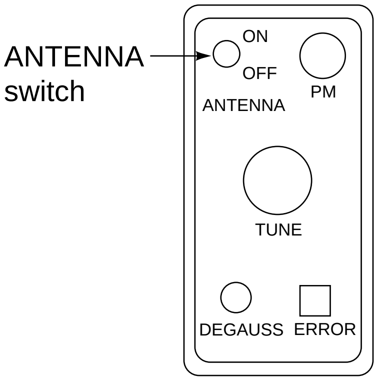


Figure 3-5 Antenna switch in tuning compartment

4. Turn off screen brilliance.
5. Transmit on the 0.125 nm range.
6. Connect a multimeter, set to the 10 VDC range, between #1(+) and #2(-) of J829 in the scanner unit.
7. Adjust the position of the sliding contact R812 to show a value between 7.0 V and 7.5 V on the multimeter.
8. Remove the TX-HV fuse (F801, 0.5A) from the power supply unit for the scanner unit.
9. Transmit on maximum range.
10. Adjust the position of the sliding contact R811 to show a value between 4.5 V and 5.0 V on the multimeter.
11. Insert TX-HV fuse F801.
12. Press [RADAR MENU] [0] [0] [0] [2] [0] [5] to select the 5. SCANNER STOPPED field and the TX option.

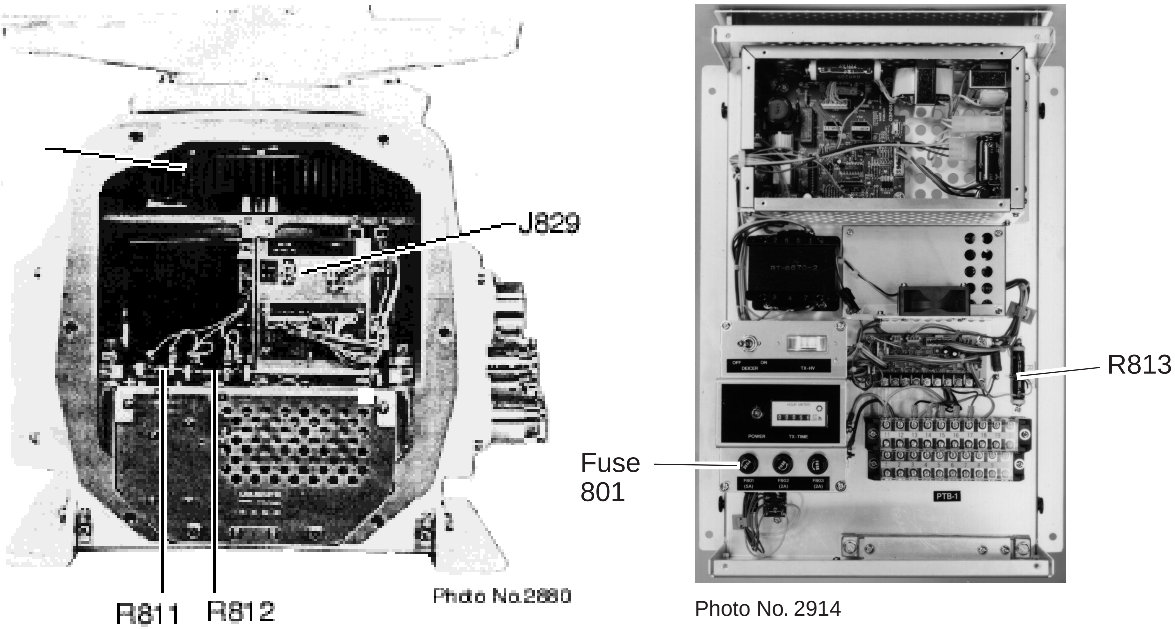


Figure 3-6 Scanner unit, power supply unit PSU-001

Note: When the length of the cable between the scanner unit and the power supply unit is more than 60 meters, the magnetron heater voltage may not reach the lower limit due to voltage drop. If this is the case, increase the voltage with the sliding contact R813 in the power supply unit, and readjust with R811, R812 in the scanner unit.

3.8 Initial Setting Menus

The INITIAL SETTING menus (four menus) and the OWN SHIP INFORMATION menu setup the radar according to expected usage, authorities specification, ship's characteristics, operator's preference, etc. Set items on each menu in accordance with regulations/operator's preference. After entering initial settings, reset the power.

Press [RADAR MENU] [0] [0] [0] [2]

[INITIAL SETTING 1]

1 [FUNCTIONS(4)]	
2 HL ALIGN	
	EBL 0.0°
3 TIMING ADJ	
	VRM 00.00
4 ANT HGT	5m/7m/10m/15m/ 20m/30mMORE
5 LOG PULSE	200P
6 [OWN SHIP INFORMATION]	
7 MBS	MBS TIMING VRM 0 MBS LEVEL EBL 0
8 ON TIME	000000.0H
9 TX TIME	000000.0H
0 [INITIAL SETTING(2)]	

Press [6]

[OWN SHIP INFORMATION]

1 [INITIAL SETTING(1)]	
2 SHIP'S LENGTH	000m
3 SHIP'S WIDTH	00m
4 RADAR POSN	FOR BOW 000m FOR PORT 00m
5 NAV ANT POSN	FOR BOW 000m FOR PORT 00m
6 TURN RATE	00KT 00.0° / s 00KT 00.0° / s
7 SPEED RATE	00KT 0.00KT/s 00KT 0.00KT/s

Press [0]

[INITIAL SETTING 2]

1 [INITIAL SETTING(1)]	
2 LOG GYRO INPUT	LOG PULSE/SERIAL DATA GYRO AD/10/SERIAL DATA
3 OWN SHIP VECTOR	COMPASS/COURSE
4 KEY BEEP	ON/OFF
5 SCANNER STOPPED	ST-BY/TX
6 VIDEO SIG	ANALOG/DIGITAL
7 ALARM LEVEL	4/5/6/7
8 DISPLAY	MAIN/SUB
9 SECTOR BLKG	OFF/ON 000° → 000° 000° → 000°
0 [INITIAL SETTING(3)]	

Press [0]

[INITIAL SETTING 3]

1 [INITIAL SETTING(2)]	
2 TRAILS RESTART	OFF/ON
3 ECHO AVG W/O GYRO	OFF/ON
4 HEAD UP TB SCALE	DEG/16POINT
5 CTR ECHO STRETCH	OFF/ON
6 VIDEO CONTRAST	1/2/3
7 MAXIMUM RANGE	72/96/120
8 ECHO FULL COLOR	OFF/ON
9 INDEX LINES	2/3/6
0 [INITIAL SETTING(4)]	

Press [0]

[INITIAL SETTING 4]

1 [INITIAL SETTING(3)]	
2 MODEL	FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
3 TYPE	R/N/G/D
4 CTR STC CURVE	L/M/H
5 RJ-7	OFF/ON
6 RJ-8	OFF/ON
	ANT A FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
	ANT B FR-2115, 2125/ OTHER X-BND/ FR-2165DS, 2135SW/ OTHER S-BND
7 SHIP'S TYPE	DEEP SEA/FISHING/ LONG LINE FISHING
8	
9 CABLE LENGTH	500m/5000m
0 FACTORY DEFAULT	

INITIAL SETTING1 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2]

HL ALIGN: Aligns heading.

TIMING ADJ: Adjusts sweep timing.

ANT HGT: Enter height of scanner above water. Select from 5 m, 7 m, 10 m, 15 m, 20 m, or more than 30 m.

LOG PULSE: Enter speed log's pulse rate.

OWN SHIP INFORMATION: Enter ship's characteristics; length, width, radar scanner position, navigation antenna position, turn rate, and speed rate. See the description on the next page for further details.

MBS: Suppresses main bang.

ON TIME, TX TIME: Shows number of hours the radar has been turned on and transmitted, respectively. Value can be changed.

INITIAL SETTING2 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0]

LOG GYRO INPUT: Select LOG or GYRO input type. LOG: Select pulse or serial data. GYRO: Digital from A/D converter or serial data.

OWN SHIP VECTOR: Select reference for own ship vector; compass or course.

KEY BEEP: Turns key response beep on or off.

SCANNER STOPPED: Set to ST-BY in normal use. TX enables transmission state without scanner rotation.

VIDEO SIG: Set to ANLG (analog) for normal use. Select DIGITAL to adjust QV (Quantized Video).

ALARM LEVEL: Sets echo strength which triggers guard alarm. "7" is strongest echo; "4" is medium strength echo.

DISPLAY: Select radar display function; main or sub (slave).

SECTOR BLKG: Sets area (up to 2) where no radar pulses will be transmitted. For example, set the area where an interfering object at the rear of the scanner would produce a dead sector (area where no echoes appear) on the display. To enter an area, select ON and enter relative bearing range of the area.

INITIAL SETTING3 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0] [0]

TRAILS RESTART: Selects whether to restart or discontinue target trails when changing the range. ON restarts trailing on newly selected range; OFF discontinues trails.

ECHO AVG W/O GYRO: Echo averaging can be turned on without gyrocompass connection.

HEAD UP TB SCALE: Bearing scale may be shown in degrees or compass points in the head-up mode.

CTR ECHO STRETCH: Turn on to enlarge echoes in the range up to the first range ring.

VIDEO CONTRAST: For factory use. Do not change setting.

MAXIMUM RANGE: For factory use. Do not change setting.

ECHO FULL COLOR: Echoes may be displayed in one color or multi-color. Select ON for multi-color display.

INDEX LINES: Selects the number of index lines to display; 2, 3, or 6.

INITIAL SETTING4 menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [0] [0] [0]

MODEL: Selects radar model.

TYPE: Selects specification of radar. Select R for R type; G for IMO type.

CTR STC CURVE: Selects level of STC affect; Low, Medium or High.

RJ-7, RJ-8: Selects which Interswitch unit to use.

SHIP'S TYPE: Select class of vessel; deep sea, fishing, long line fishing.

CABLE LENGTH: Set for "500."

FACTORY DEFAULT: Restores all menus' default settings.

OWN SHIP INFORMATION menu

Keying sequence: [RADAR MENU] [0] [0] [0] [2] [6]

SHIP'S LENGTH: Enter ship's length.

SHIP'S WIDTH: Enter ship's width.

RADAR POSN: Enter distance from both bow and port to the radar scanner location.

NAV ANT POSN: Enter distance from both bow and port to the navigation antenna location.

TURN RATE: Enter ship's turn rate.

SPEED RATE: Enter ship's speed rate.

INSTALLATION OF OPTIONAL EQUIPMENT

4.1 Gyro Converter GC-8

The Gyro Converter GC-8, incorporated inside the radar display unit, converts analog gyrocompass reading into digital coded bearing data for display on the radar display.

This section explains how to install and setup the GC-8 (mainly consisting of the GYRO CONVERTER Board) and set it up according to gyrocompass connected.

Installation and connection of the GYRO CONVERTER Board

Necessary Parts: GC-8-2 (008-446-520)

Name	Type	Qty	Code No.
Gyro Converter Board	64P1106	1	004-412-220
Screws	M3x8, C2700W	5	000-881-404
Sticker	64-014-20211	1	100-132-701

1) Turn off the power.
2) Open the display unit. See Chapter 1 for instructions.
3) Fasten the GYRO CONVERTER Board inside the display unit with four washerhead screws (supplied).

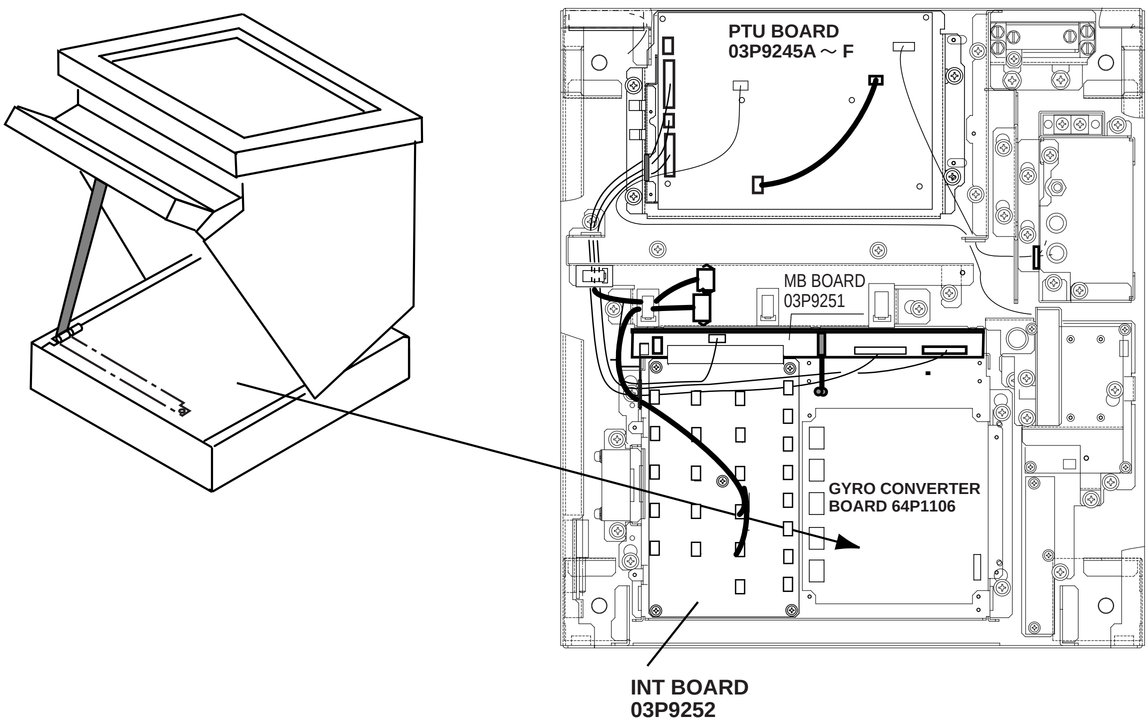


Figure 4-1 Display unit, inside view

4) Connect the GYRO CONVERTER Board to the INT Board (cables supplied with GC-8) as shown below.

INT Board		GYRO CONVERTER Board
J446 (4P)	↔	J7 (5P)
J465 (6P)	↔	J1 (14P)

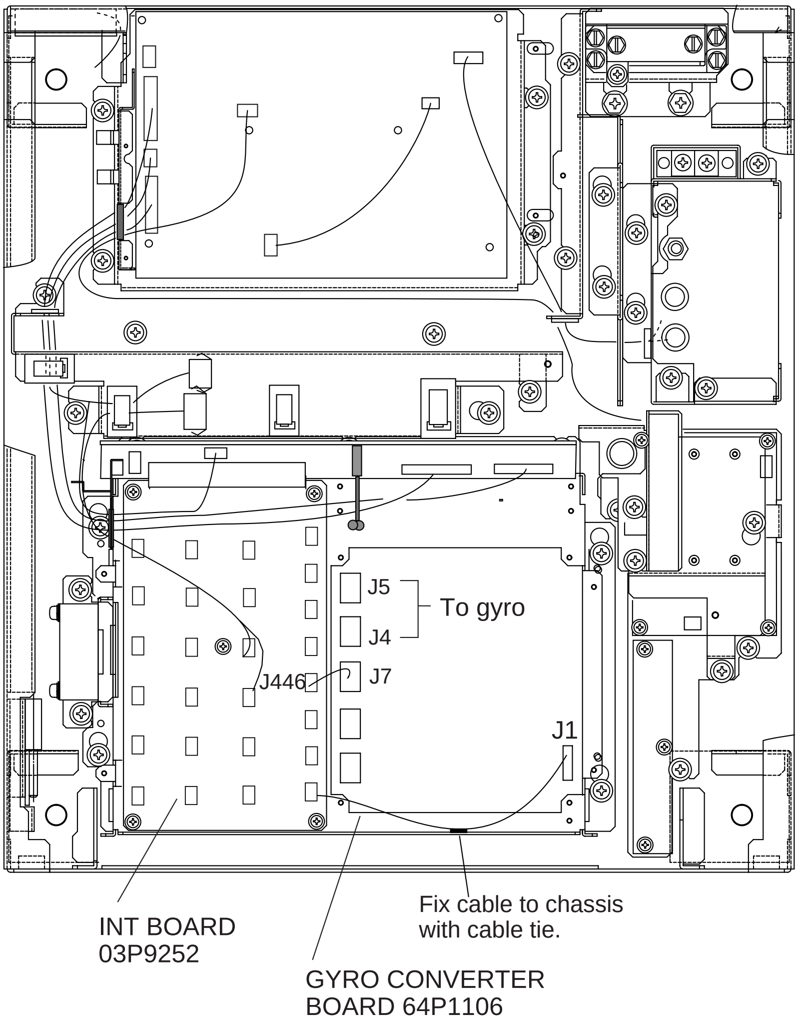


Figure 4-2 Display unit, inside view

5) Confirm gyrocompass specifications and set up the DIP switches and jumper wires on the GYRO CONVERTER Board according to gyrocompass connected:
   - Setting jumper wires and DIP switches by gyrocompass specifications: page 4-3
   - Setting jumper wires and DIP switches by make and model of gyrocompass: page 4-5
   - Location of jumper wires and DIP switches: page 4-6

6) Solder the gyrocompass cable to the VH connector assemblies (supplied).

7) Attach instruction label (supplied) to the shield cover for the INT and GYRO CONVERTER boards.

8) Close the display unit.

9) Turn the power off and on to reset the CPU.

Connection of external power supply

An external power supply is necessary when the repeater signal is step-by-step type and the step voltage is below 20V or output voltage is less than 5 W.

1. Cut jumper wire JP1 on the GYRO CONVERTER Board when an external power supply is used.
2. Connect gyro cable and power cable as shown below.

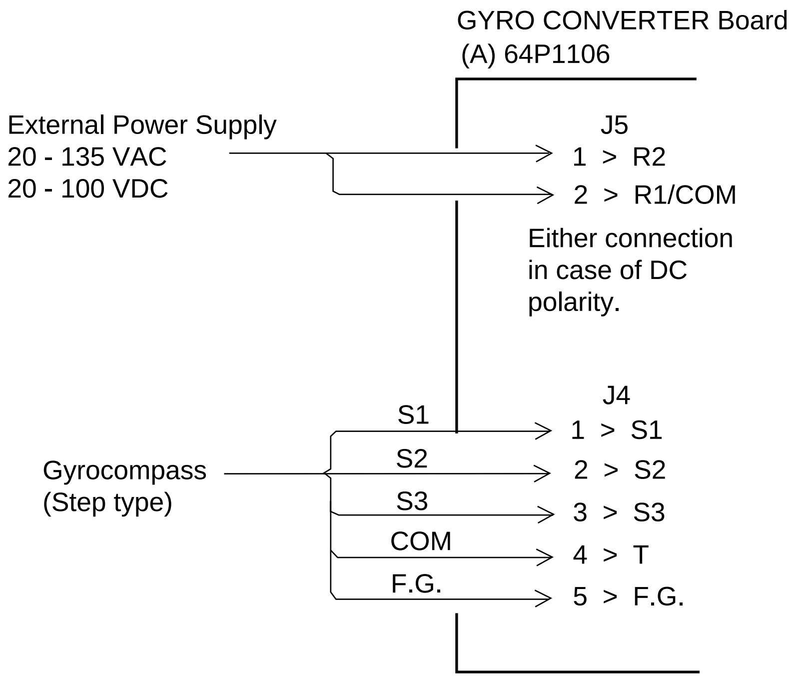


Figure 4-3 Connection of external power supply to GYRO CONVERTER Board

DIP switch, jumper wire settings

Default setting

The default setting of all DIP switches is off and all jumpers wire are set to “#1.” (Note that jumper wire JP1 is set at #1, #2, and #3.) In those settings the gyrocompass having the following characteristics can be directly connected; modification of the GYRO CONVERTER Board is not necessary.

AC synchronous signal: 50/60 Hz
Rotor voltage: 60 V to 135 V AC
Stator voltage: 60 V to 135 V AC
Gear ratio: 360x
Supply voltage: 30 V to 135 V AC

If the specifications of the gyrocompass differ from those mentioned above, change jumper wire and DIP switches settings on the GYRO CONVERTER Board. Settings may be changed according to gyrocompass specifications or make and model of gyrocompass (see page 4-5). For the location of DIP switches and jumper wires, see page 4-6.

Setting method 1: by gyrocompass specifications

1) Gyrocompass type

Gyrocompass type	SW 1-4	SW 1-5	SW 1-6	JP1
AC synchronous	OFF	OFF	OFF	#1, #2, #3
DC synchronous	OFF	OFF	OFF	#2, #3, #4
DC step	ON	OFF	OFF	#4, #5, #6
Full-wave pulsating current	OFF	ON	OFF	#4, #5, #6
Half-wave pulsating current	ON	ON	OFF	#4, #5, #6

2) Frequency

Frequency	SW 1-7	SW 1-8	Remarks
50/60Hz	OFF	OFF	AC synchronous pulsating current
400Hz	ON	OFF	AC synchronous pulsating current
500Hz	OFF	ON	AC synchronous pulsating current
DC	ON	ON	DC synchronous DC step

3) Rotor voltage (between R1 & R2)

Rotor voltage	SW 2-1	JP3
20V to 45V AC	ON	#2
30V to 70V AC	OFF	#2
40V to 90V AC	ON	#1
60V to 135V AC	OFF	#1

4) Stator voltage (between S1 and S2)

Stator voltage	SW 2-2	SW 2-3	JP2
20V to 45V AC, or 20V to 60V DC	ON	OFF	#2
20V to 45V AC, or 20V to 60V DC	OFF	OFF	#2
40V to 90V AC	ON	OFF	#1
60V to 135V AC	OFF	OFF	#1

5) Ratio

Ratio	SW1-1	SW 1-2	SW1-3
360x	OFF	OFF	OFF
180x	ON	OFF	OFF
90X	OFF	ON	OFF
36X	ON	ON	OFF

6) Supply voltage

Supply voltage	JP4	JP5
20V to 45V AC, or 20V to 60V DC	#2	#2
30V to 135V AC, or 40V to 100V DC	#1	#1

7) AD-10 format data Tx interval

Select data transmitting interval for ports 1 to 6 by jumper wires JP6 and JP7.

Note: The Tx interval is available in 25 msec or 200 msec. 25 msec is for radar; 200 msec is for all other equipment.

8) NMEA-0183 Tx interval

Tx interval	SW2-4
2 seconds	ON
1 second	OFF

Setting method 2: by make and model of gyrocompass

Maker	Models	Specification	SW 1-1	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8	SW 2-1	SW 2-2	SW 2-3	JP1	JP2	JP3	JP4	JP5
FURUNO	GY-700	DC step 100V 180x 5-wire, open collector	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	OFF	OFF	#4, #5,#6	#2	-	#1	#1
Anschutz	Standard 2,3	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	Standard 4,6	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#1	#1	#1
	Standard 20	DC step 35V 180x COM(-) ,3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
Yokogawa Navtec (Plaith type)	C-1/1A/2/3 A-55, B-55	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 22V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	#1, #2,#3	#2	#2	#1	#1
	CMZ-700	DC step 24V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	Remo- ve	#2	–	*	*
	CMZ-250X/ 300X/500	DC synchronous 360x	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	-	ON	OFF	Remo- ve	#2	–	*	*
		DC step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
	CMZ-100/200/ 300 C-1Jr,D-1Z/1/3 IPS-2/3	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	CMZ-50 Note	step 35V 180x COM(+),3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	Remo- ve	#2	–	*	*
Plaith	NAVGAT II/III	AC synchronous 50/60Hz Rotor voltage: 50/60V Stator voltage: 68V 360x	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#2	#2	#1	#1
Tokimec (Sperry type)	ES-1/2/11 GLT-101/102/ 103/106K/107	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 36x	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	ES-11A/110 TG-200 PR222R/2000 PR237L/H GM 21	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 22V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	MK-14 MOD-1/2/T NK-EN,NK-EI	DC step 70V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	SR-130/140	DC step 70V 180x 5-wire, open collector	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	TG-100/5000 PR-357/130/ 140, ES-17 GLT-201/202 /203	DC step 70V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
	TG-6000	DC step 24V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	-	ON	OFF	#4, #5,#6	#2	–	#2	#2
	GM-11	AC synchronous 50/60Hz Rotor voltage: 100V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
	SR-120,ES-16 MK-10/20/30	DC step 35V 180x	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	#4, #5,#6	#2	–	#2	#2
Kawasaki	GX-81	AC synchronous 50/60Hz Rotor voltage: 100/110V Stator voltage: 90V 90x	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	#1, #2,#3	#1	#1	#1	#1
Armabrown	MK-10,MKL-1 SERIES1351, MOD-4	DC step 50V 180x COM(+), 3-wire(-)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	OFF	OFF	#4, #5,#6	#2	–	#1	#1
Robertson	SKR-80	DC step 35V 180x COM(-), 3-wire(+)	ON	OFF	OFF	ON	OFF	OFF	ON	ON	–	ON	OFF	#4, #5,#6	#2	–	#2	#2

*: Set JP4 and JP5 according to the voltage of the external power supply.
Note: If CMZ-50 has 35VDC, set JP1 to #4, #5, #6.

Location of DIP switches, jumper wires on the GYRO CONVERTER Board

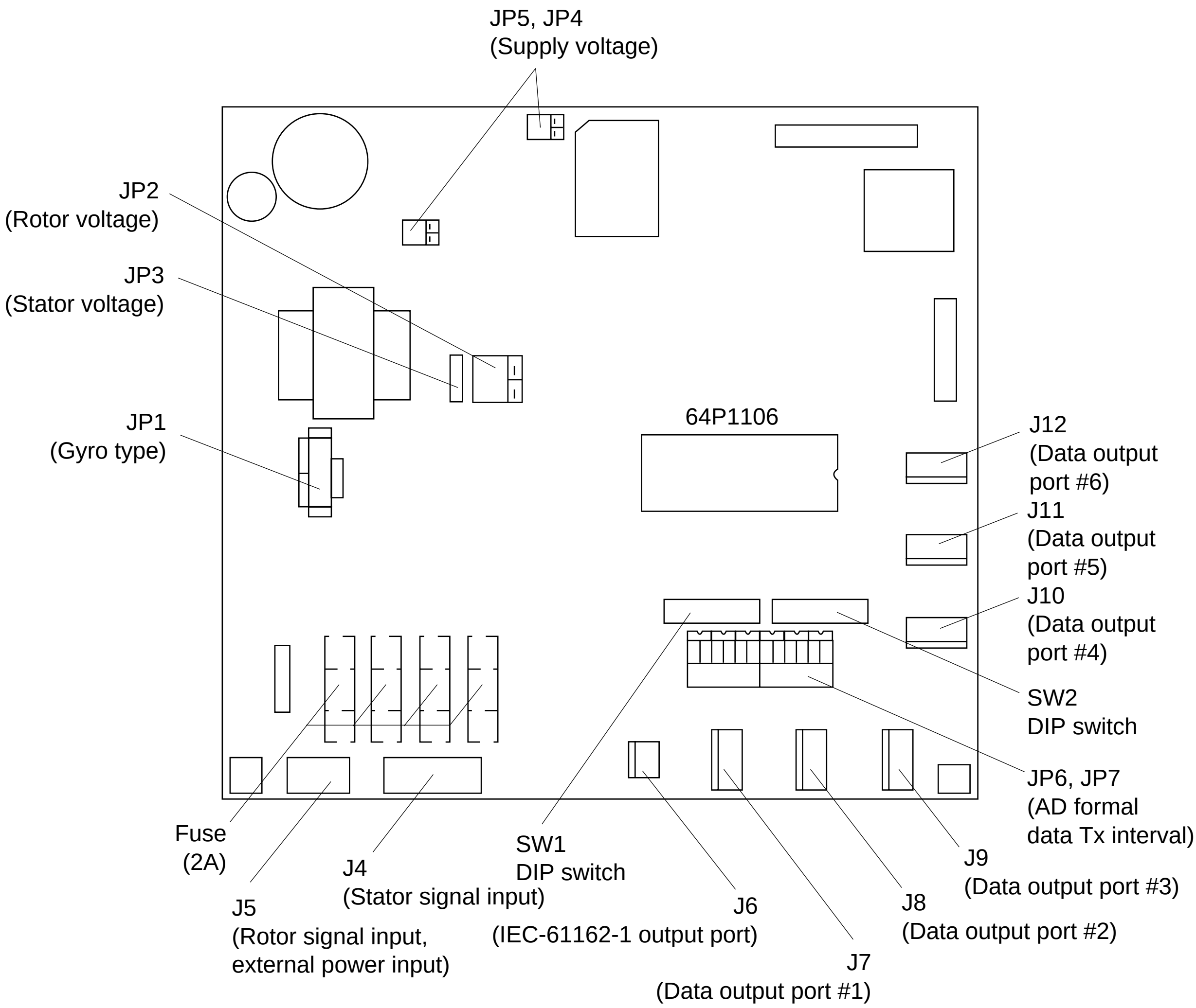


Figure 4-4 GYRO CONVERTER Board

Setting the heading readout on the radar display

Confirm that the gyrocompass is giving a reliable readout. Then, set the heading readout on the radar display with the gyrocompass readout as follows:

1. Press [RADAR MENU] to display the FUNCTIONS 1 menu.
2. Press the [0] key twice to display the FUNCTIONS 3 menu.
3. Press the [9] key to select the GYRO SETTING option.
4. Rotate the EBL control to align the radar's HDG readout with the gyrocompass.
5. Press [ENTER] to conclude the setting.

4.2 ARP Board ARP-26

The ARP Board ARP-26, which provides ARPA functions, is an optional circuit board which is accommodated in the display unit of the FR-2105 series radar.

Necessary Parts: ARP-26-2E (008-485-500)

Name	Type	Qty	Code no.
ARP board	18P9002B	1	008-473-650

Installation of the ARP board

1. Remove the bottom cover of the display unit by unfastening four screws.
2. Set the ARP Board in the center slot of the PCB card case.

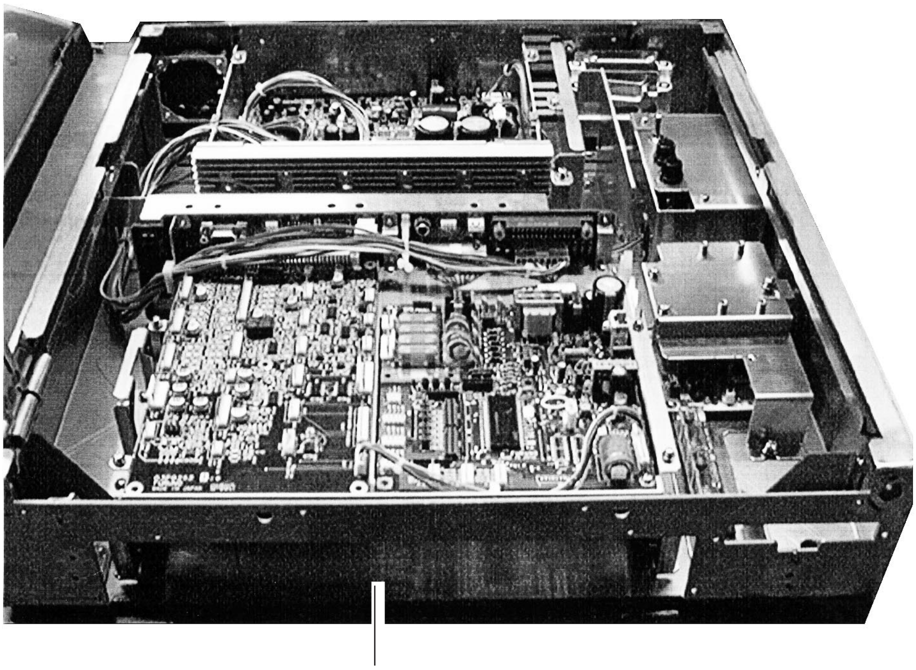


Figure 4-5 Display pedestal inside view

3. Adjust the ARP referring to the procedure on the next page.

ARP board adjustment

1. Turn the GAIN, A/C SEA and A/C RAIN controls fully counterclockwise, and then transmit on the 12 nm range.
2. Connect a digital multimeter between TP7(+) and TP6(-) on the ARP Board.

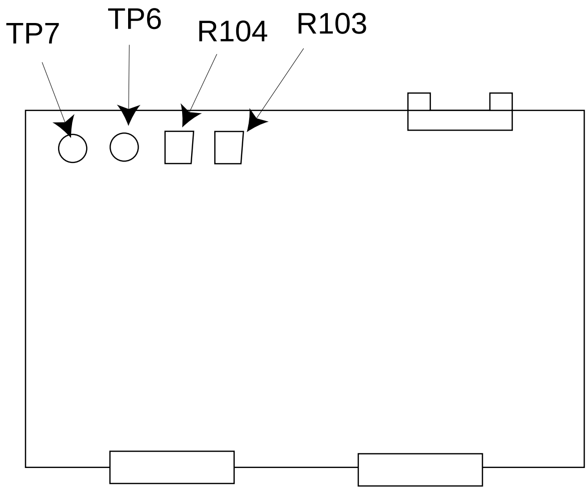


Figure 4-6 ARP Board (18P9002B)

3. Adjust R104 on the ARP Board so the multimeter reads between 0.09 and 0.14 VDC.
4. Set controls and switches as below.

   GAIN: fully clockwise (max.)
   Interference rejector: OFF
   Range: 24 nm
   Echo stretch: OFF

5. Press [RADAR MENU] [0] [0] [0] [0] open the INITIAL SETTING3 menu.
6. Set the VIDEO SIG field to DIGITAL and press [ENTER].
7. Adjust R103 on the ARP Board so noise just appears on the display.

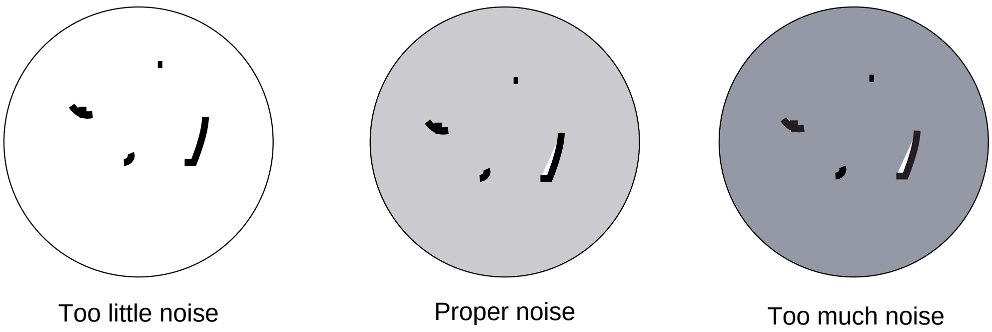


Figure 4-7 How to adjust noise

8. Set VIDEO SIG to ANALOG and press [ENTER].

Final check

Connect a gyrocompass and a log to the radar and place the radar under transmit state. Confirm that LEDs CR9, CR10, CR11, CR12, CR15 and CR16 on the ARP Board are off. If ship's speed is zero, or other signal is not being input, corresponding LED will light.

#4	#3	#2	#1
OFF	OFF	OFF	OFF

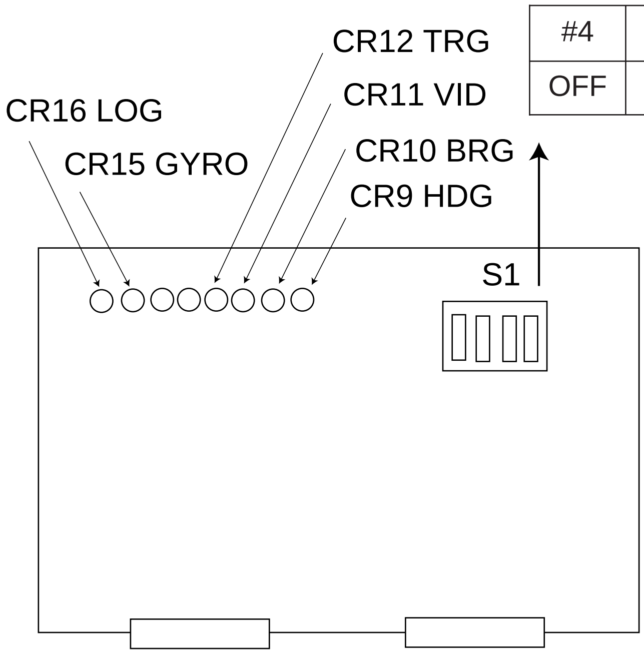


Figure 4-8 ARP Board ARP-26

4.3 RP Board RP-26

The RP Board RP-26, which providesvideo plotter functions, consists of a circuit board and a card drive both of which are accommodated in the display unit of the FR-2105 series radar.

Table top/console type

Necessary Parts: RP-26-T-2E (008-485-520)

Name	Type	Qty	Code no.
RP board	14P0298	1	008-487-640
Card case assy.	–	1	–
Panhead screw B	M4x8 C2700W	4	000-881-445
Panhead screw B	M3x8 C2700W	2	000-881-404
Panhead screw A	M2.6x5 C2700W	2	000-800-973
Teethed lock washer (Outside teeth)	M4 C5191W	1	000-864-506
Cable assy.	HIF6-100D-A-A-52	1	000-137-553

1. Lift the monitor and fix it with the stay. Refer to Chapter 1 for instructions.
2. Remove the right arm cover from the control head.
3. Fasten the card case to the right arm cover as follows:
   a) Fasten the ground wire with an M4x10 screw and washer (supplied) as shown below.
   b) Fasten the arm cover to the card case with three M4x8 screws (supplied).

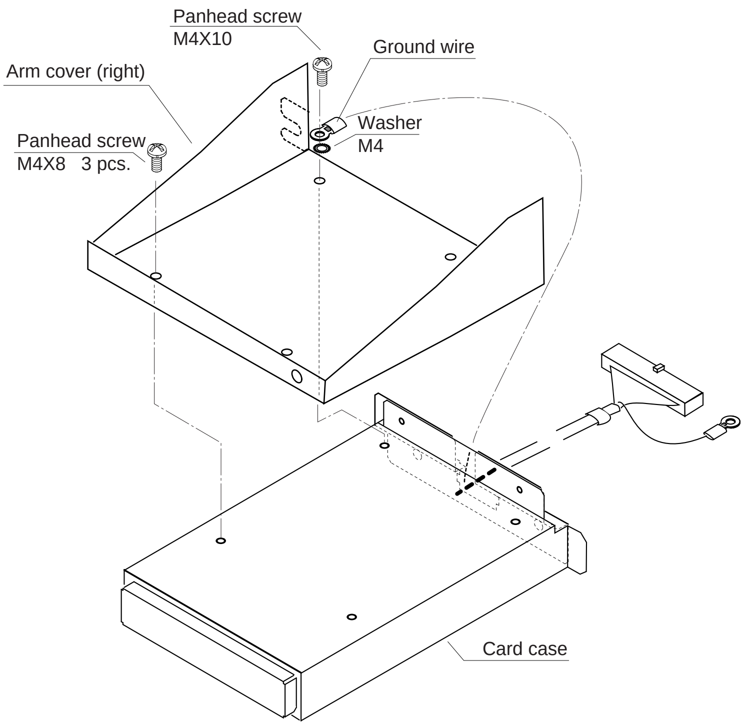


Figure 4-9 Fastening the card case to the right arm cover

4. Unfasten the front panel from the display pedestal.
5. Pass the connector from the card case through the hole in the display pedestal.

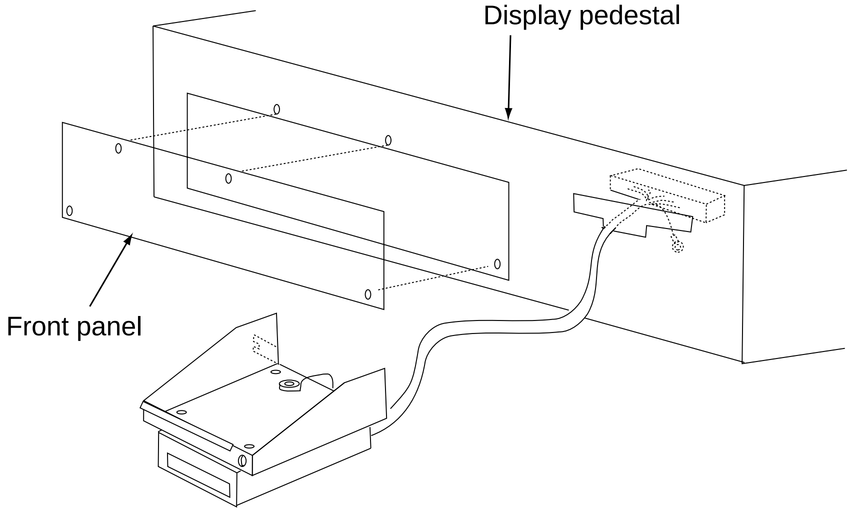


Figure 4-10 Display pedestal

6. Set the RP Board (14P0298) in the top slot of the pcb card case. See page 4-7 for the location of the pcb card case.
7. Run the connector from the card case in front of the GYRO CONVERTER Board.
8. Plug the connector in J1 on the RP Board.
9. Fasten the ground wire from the connector at the location shown below.

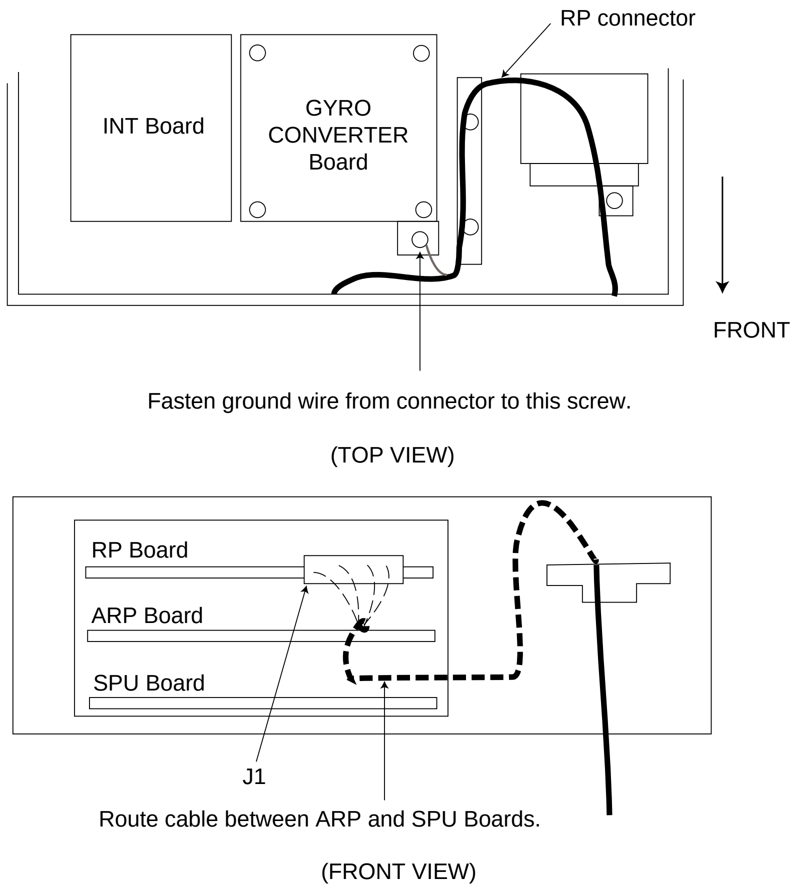


Figure 4-11 Display pedestal, top view

10. Fasten the front panel on the display pedestal.
11. Retract the stay to close the display unit.
12. Fasten the right arm cover.

Separate type control head

Necessary parts: RP-26-Z-2E (Code no. 008-491-400)

Name	Type	Qty	Code No.
Card Case Assy.	–	1	–
RP Board	14P0298	1	008-487-640
Pan Head Screw B	M4x8 C2700W	1	000-881-445
Pan Head Screw B	M3x8 C2700W	2	000-881-404
Pan Head Screw A	M2.6x5 C2700W	2	000-800-973

1. Lift the monitor. See Chapter 1 for instructions.
2. Fasten the mounting base with one M4 x 8 screw as below.

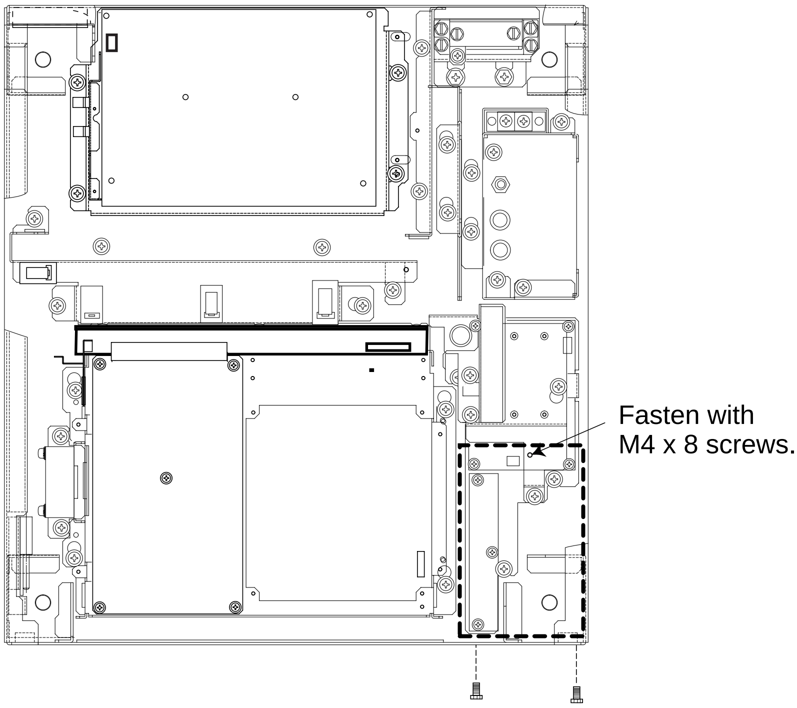


Figure 4-12 Display unit, inside view

3. Fix the mounting base to front panel with two M3 x 8 screws.
4. Set the M-card case lid to the hole in the front panel and fix with two M2.6 x 5 screws.

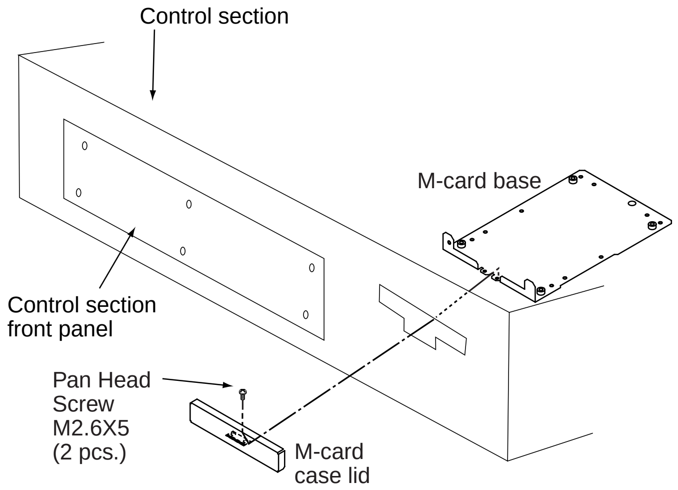


Figure 4-13 Display pedestal, front view

5. Loosen six screws to remove the front panel on the display pedestal.
6. Set the RP Board (14P0298) in the top slot of the pcb card case.
7. Run the connector from the card case in front of the GYRO CONVERTER Board.
8. Plug the connector in J1 on the RP Board.
9. Fasten the ground wire from the connector at the location shown below.

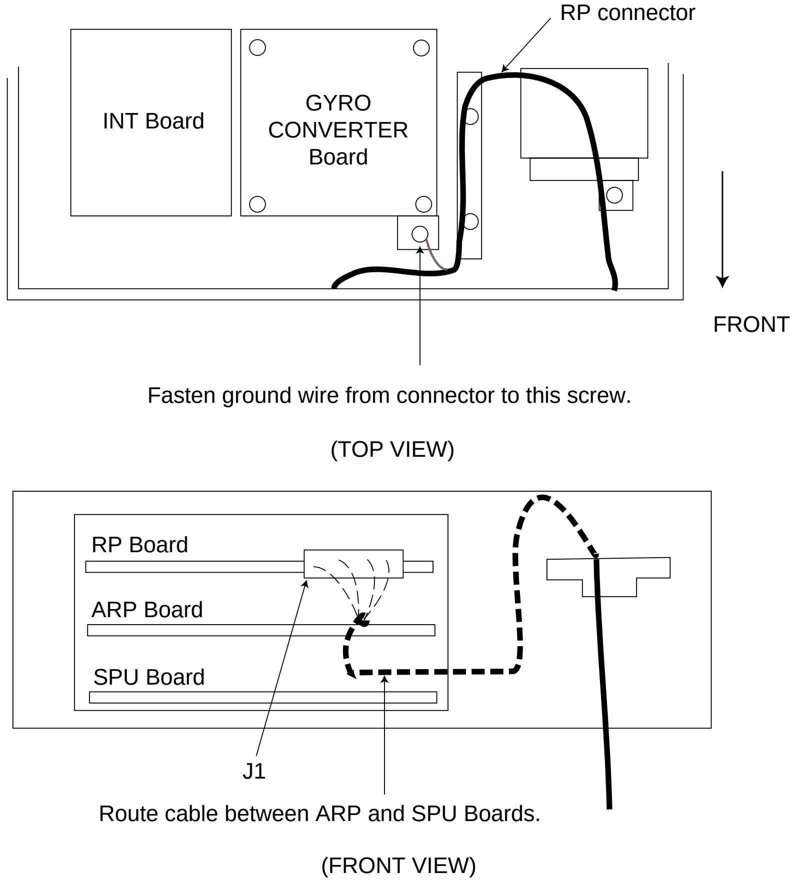


Figure 4-14 Display pedestal, top view

10. Fasten the front panel of the display pedestal.
11. Fasten the ground wire to the location shown in Figure 4-14.
12. Close the monitor.

4.4 Performance Monitor PM-30

Necessary parts: PM-30 and OP03-150 (Code no. 008-485-490)

Name	Type	Qty	Code No.
PM Board	03P9225	1	008-487-620
Pan Head Screw	M3x8 C2700W	3	000-881-404
Connector Assy.	VH3P-L300-AA	2	000-141-014

1. Lift the monitor. See Chapter 1 for instructions.
2. Fasten the PM Board 03P9225 to the location shown below with three screws (M3 x 8).

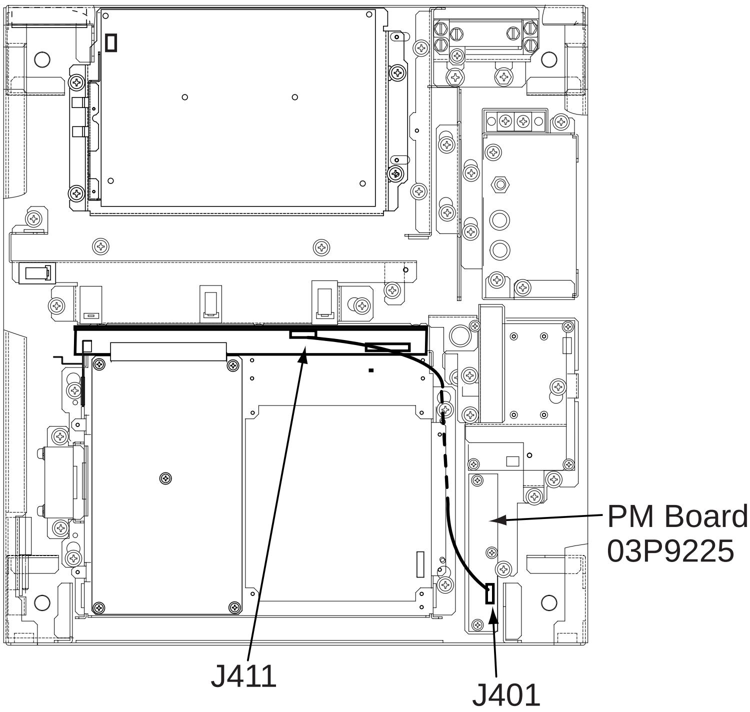


Figure 4-15 Display unit, inside view

3. Connect the connector P401 coming from J411 to J401 on the PM Board.
4. Connect two connector assemblies (VH3P-L300-AA) to J402 and J403.
5. Solder the other end of there connector assemblies with external cables, one from ship’s mains and one from the PM-30.
6. Close the monitor.

4.5 Alarm Kit

Necessary parts: OP03-156 (Code no. 008-500-650)

The alarm kit mainly consists of a circuit board and connection cables, and provides alarm output to ship's bridge alarm system.

Contents of Alarm Kit OP03-156

Name	Type	Code No.	Qty
ALARM Board	03P9262	008-500-680	1
NH Connector Assy.	03-1990(9-9P)	008-500-700	1
NH Connector Assy.	03-1991(3P)	008-500-710	4
Cable Band	HP-3N	000-570-001	1
Cable Tie	CV-100	000-570-322	3
Pan-head Screw B	M3X8 C2700W	000-881-404	4
Pan-head Screw B	M4X12 C2700W	000-881-447	1

Procedure

Refer to the figure below for parts locations.

1. Raise the monitor and fix it with the stay. (See page 1-5 for instructions.)
2. Unfasten four screws to dismount the shield cover for the INT Board.
3. Fasten the ALARM Board to the display unit with four pan-head screws (M3X8, supplied).
4. Connect the NH connector (9-9P, supplied) between J471 on the ALARM Board and J451 (EXT-BUZ) on the INT Board, passing it through the cable band and binding it with existing cable tie.
5. Fasten the cable band (supplied) with a pan-head screw (M4X12, supplied) and attach two cable ties (CV-100, supplied).
6. Connect an NH connector (3P, supplied) to each of J472, J473, J474 and J475 on the ALARM Board.
7. Route the NH connectors along the cables ties and pass them through the cable clamp. Fasten the shield cover removed at step 1.
8. Close the INT board cover.
9. Close the monitor.
10. Connect NH connectors to ship's bridge alarm system:

    J472: ARPA guard zone; target alarm
    J473: SYSTEM FAILURE (HP, BP, TRIG, VIDEO, GYRO, AZI)
    J474: ARPA CPA/TCPA
    J475: Spare

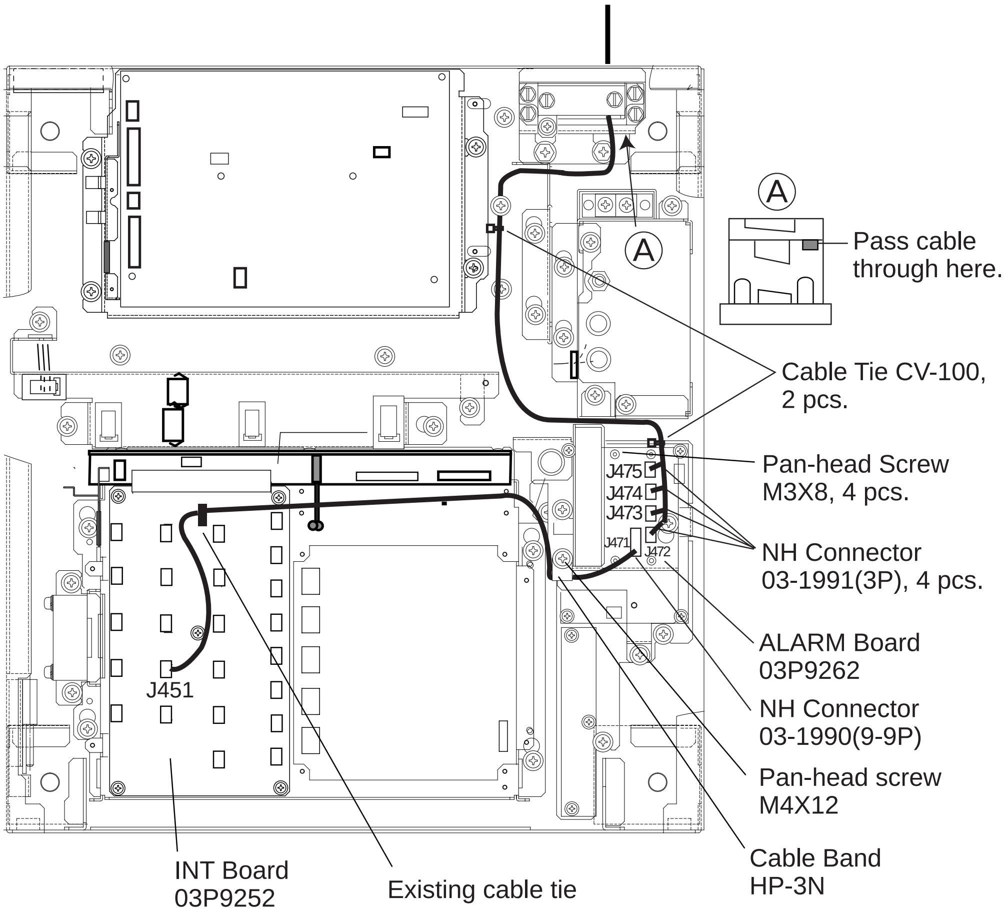
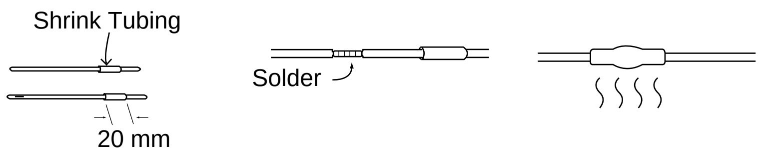


Figure 4-16 Display unit, inside view

HOW TO INSULATE THE POWER CABLE



① Make length of shrink tubing 20 mm; slip tubing onto wiring.

② Solder power cable to signal cable.

③ Heat shrink tubing with soldering iron.

FURUNO

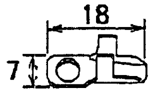
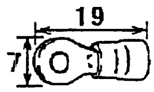
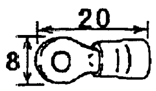
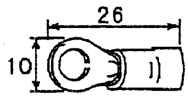
CODE NO.	008-452-540	03EP-X-9405 -4
TYPE	CP03-13907	1/1

工事材料表

INSTALLATION MATERIALS

FR/FAR-2125W
FR-2135S/-B
FR-2135SW/-MSA
FR-2155/-B/2165DS
FR/FAR-2825W
FR/FAR-2835S/SW
FR/FAR-2855/W
FR/FAR-2865SW

船舶用レーダー
MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	特殊ラグ LUG		ｱﾅｹｲ4　ｽｽﾞ		2	
			CODE NO.	000-536-100		
2	圧着端子 CRIMP-ON LUG		FV1.25-M3 ｱｶ		16	
			CODE NO.	000-538-110		
3	圧着端子 CRIMP-ON LUG		FV1.25-4		11	
			CODE NO.	000-538-114		
4	圧着端子 CRIMP-ON LUG		FV5.5-4		19	
			CODE NO.	000-538-123		

DWG NO. C3387-M01- E

FURUNO ELECTRIC CO., LTD

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

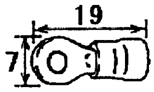
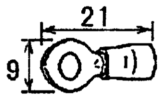
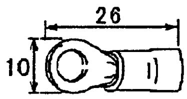
FURUNO

CODE NO.	008-452-790	03EP-X-9409 -3
TYPE	CP03-13916	1/1

工事材料表

INSTALLATION MATERIALS

FR-2155/2155-B 船舶用レーダ
FR-2165DS
FR/FAR-2855
MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	圧着端子 CRIMP-ON LUG		FV1.25-M3 ｱｶ		9	
			CODE NO.	000-538-110		
2	圧着端子 CRIMP-ON LUG		FV2-4A ｱｵ		11	
			CODE NO.	000-538-118		
3	圧着端子 CRIMP-ON LUG		FV5.5-4		5	
			CODE NO.	000-538-123		

DWG NO. C3390-M03- D

FURUNO ELECTRIC CO ., LTD

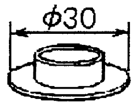
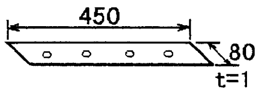
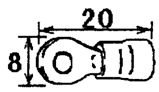
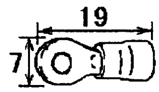
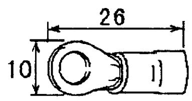
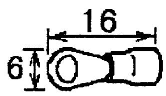
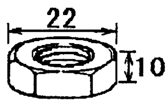
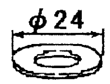
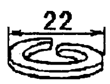
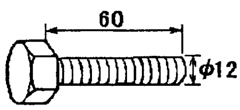
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-494-600	03FT-X-9406 -3
TYPE	CP03-19501	1/2

工事材料表
INSTALLATION MATERIALS

FR-2155/B

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	シールワッシャ SEAL WASHER		03-001-3002-0 CODE NO.	300-130-020	4	
2	防蝕ゴム CORROSION-PROOF RUBBER MAT		03-029-0301-2 CODE NO.	100-091-112	2	
3	圧着端子 CRIMP-ON LUG		FV1.25-4 CODE NO.	000-538-114	18	
4	圧着端子 CRIMP-ON LUG		FV1.25-M3 ｱｶ CODE NO.	000-538-110	26	
5	圧着端子 CRIMP-ON LUG		FV5.5-4 CODE NO.	000-538-123	2	
6	圧着端子 CRIMP-ON LUG		FVD1.25-3 CODE NO.	000-116-634	1	
7	六角ﾅｯﾄ　1種 HEX.NUT		M12 SUS304 CODE NO.	000-863-112	4	
8	ﾐｶﾞｷ平座金 FLAT WASHER		M12 SUS304 CODE NO.	000-864-132	4	
9	ﾊﾞﾈ座金 SPRING WASHER		M12 SUS304 CODE NO.	000-864-263	4	
10	六角ﾎﾞﾙﾄ（全ﾈｼﾞ） HEX. BOLT		M12X60 SUS304 CODE NO.	000-862-191	4	

DWG NO.
C3467-M02- D

FURUNO ELECTRIC CO., LTD.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

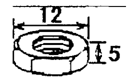
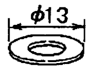
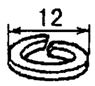
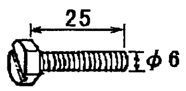
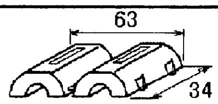
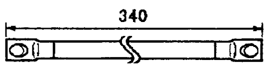
FURUNO

CODE NO.	008-494-600	03FT-X-9406 -3
TYPE	CP03-19501	2/2

工事材料表

INSTALLATION MATERIALS

FR-2155/B

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
11	六角ﾅｯﾄ 1種 HEX.NUT		M6 SUS304		1	
			CODE NO.	000-863-109		
12	ﾐｶﾞｷ平座金 FLAT WASHER		M6 SUS304		3	
			CODE NO.	000-864-129		
13	ﾊﾞﾈ座金 SPRING WASHER		M6 SUS304		1	
			CODE NO.	000-864-260		
14	六角ﾎﾞﾙﾄ HEX.BOLT		M6X25 SUS304		1	
			CODE NO.	000-862-180		
15	EMIｺｱ EMI CORE		RFC-13		2	
			CODE NO.	000-141-084		
16	ｱｰｽ線 GROUNDING WIRE		RW-4747-1 03S4747		1	
			CODE NO.	000-566-000		

DWG NO.
C3467-M03- D

FURUNO ELECTRIC CO ., LTD.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-503-450	03FS-X-9408 -1
TYPE	CP03-19105	1/2

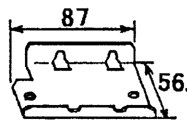
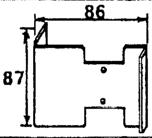
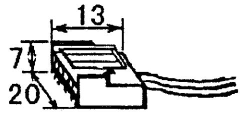
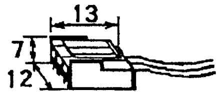
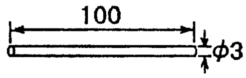
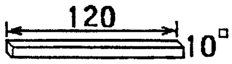
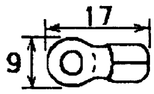
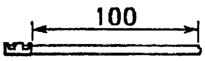
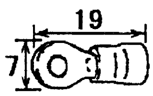
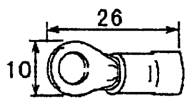
工事材料表

INSTALLATION MATERIALS

FR-2115/2115-B
FR-2125/2125V
FR-2125W/2125-B
FR-2135S/2135SW
FR-2135S-B/2165DS
FR-2155/2155-B
FR-2135SW-MSA

船舶用レーダー

MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	下クランプ前板 LOWER CLAMP FRONT PLATE		03-144-1425-1 CODE NO.	100-263-601	1	
2	下クランプ後板 LOWER CLAMP REAR PLATE		03-144-1426-0 CODE NO.	100-263-610	1	
3	VHコネクタ組品 VH CONNECTOR ASSY.		03-1737(5P) CODE NO.	008-454-380	1	
4	VHコネクタ組品 VH CONNECTOR ASSY.		03-1738(3P) CODE NO.	008-454-390	1	
5	スミチューブF(Z) HEAT-SHRINK TUBE		3X0.25 クロ ＊0.10M＊ CODE NO.	000-105-874	2	
6	シールドフォーム SHIELD FOAM		71TS-10-10＊0.12M＊ CODE NO.	000-808-456	4	
7	圧着端子 CRIMP-ON LUG		8NK4 CODE NO.	000-538-180	2	
8	NHコネクタ ＊センサイ＊ NH CONNECTOR ASSY.		AWG24 ＊0.1M＊ CODE NO.	000-132-342	20	
9	圧着端子 CRIMP-ON LUG		FV1.25-M3 アカ CODE NO.	000-538-110	5	
10	圧着端子 CRIMP-ON LUG		FV5.5-4 CODE NO.	000-538-123	2	

DWG NO. C3464-M07- B

FURUNO ELECTRIC CO ., LTD.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-503-450	03FS-X-9408 -1
TYPE	CP03-19105	2/2

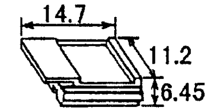
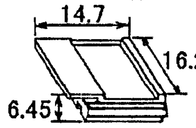
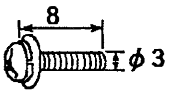
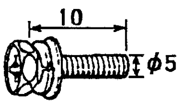
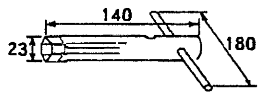
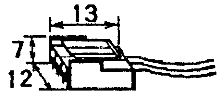
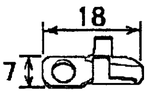
工事材料表

INSTALLATION MATERIALS

FR-2115/2115-B
FR-2125/2125V
FR-2125W/2125-B
FR-2135S/2135SW
FR-2135S-B/2165DS
FR-2155/2155-B
FR-2135SW-MSA

船舶用レーダー

MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
11	ｺﾈｸﾀ CONNECTOR		H3P-SHF-AA CODE NO. 000-505-596	2	
12	ｺﾈｸﾀ CONNECTOR		H5P-SHF-AA CODE NO. 000-505-598	2	
13	+-ﾅﾍﾞ ｾﾑｽﾈｼﾞ B WASHER HEAD SCREW		M3X8 C2700 MBNI2 CODE NO. 000-881-404	2	
14	+ｱﾌﾟ ｾｯﾄUIｾﾑｽB +HEX.BOLT (WASHER HEAD)		M5X10 SUS304 CODE NO. 000-802-288	2	
15	ﾊﾟｲﾌﾟﾎﾞｯｸｽPS PIPE BOX SPANNER		PS0017 CODE NO. 000-830-140	1	
16	ｺﾈｸﾀ(ｸﾐﾋﾝ) CONNECTOR ASSY.		VH3P-L300-AA CODE NO. 000-141-014	2	
17	特殊ラグ LUG		ｱﾅｹｲ4 ｽｽﾞ CODE NO. 000-536-100	2	

DWG NO. C3464-M08- B

FURUNO ELECTRIC CO ., LTD.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

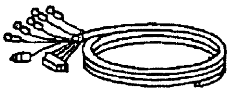
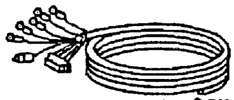
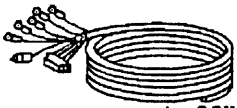
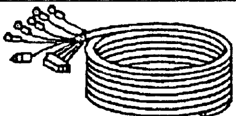
FURUNO

CODE NO.		03FT-X-9403-1
TYPE		1/1

工事材料表
INSTALLATION MATERIALS

FR-2155/2155-B 船舶用レーダー

MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	信号ケーブル組品 SIGNAL CABLE ASSY.	 L=15M	S03-80-15		1	選択 TO BE SELECTED
			CODE NO.	008-491-240		
2	信号ケーブル組品 SIGNAL CABLE ASSY.	 L=20M	S03-80-20		1	選択 TO BE SELECTED
			CODE NO.	008-491-250		
3	信号ケーブル組品 SIGNAL CABLE ASSY.	 L=30M	S03-80-30		1	選択 TO BE SELECTED
			CODE NO.	008-491-260		
4	信号ケーブル組品 SIGNAL CABLE ASSY.	 L=60M	S03-80-60		1	選択 TO BE SELECTED
			CODE NO.	008-491-270		

C3467-M01- B

FURUNO ELECTRIC CO ., LTD

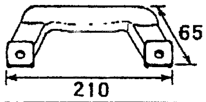
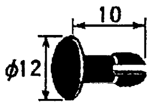
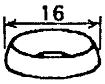
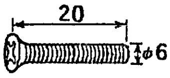
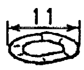
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FURUNO

CODE NO.	008-478-830	03FS-X-9501 -5
TYPE	FP03-06201	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	取手 HANDLE		14-002-1125-2 CODE NO. 840-211-252	2	
2	ｽﾅｯﾌﾟﾎﾞﾀﾝ PLASTIC RIVET		KB-13ﾖｳ ﾎﾞﾀﾝｸﾛ CODE NO. 000-570-276	4	
3	ﾛｰｾﾞｯﾄ座金 ROSETTE WASHER		M6 C2700W ﾎﾟﾘｼｰﾙ ｸﾛ CODE NO. 000-864-910	4	
4	+丸皿小ﾈｼﾞ OVAL COUNTERSUNK HEAD SCREW		M6X20 C2700W ﾎﾟﾘｼｰﾙ ｸﾛ CODE NO. 000-861-475	4	
5	波座金 WAVE WASHER		WW-6 SUS CODE NO. 000-864-350	4	

DWG NO.
C3464-F01- F

FURUNO ELECTRIC CO., LTD.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

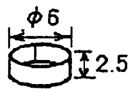
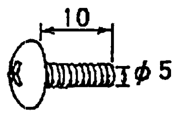
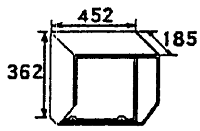
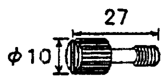
FURUNO

CODE NO.	008-490-970	03FS-X-9502 -4
TYPE	FP03-06503	1/1

付属品表
ACCESSORIES

FR-2115/2115-B
FR-2125/2125W
FR-2125-B
FR-2155/2155-B
FR-2135S/2135SW
FR-2135S-B/2165DS
GD-680/GP-680

船舶用レーダ
カラービデオプロッタ
カラーGPSプロッタ
MARINE RADAR
COLOR VIDEO PLOTTER
COLOR GPS PLOTTER

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	マキスペーサー SPACER		5X2.5 CODE NO. 000-808-429	2	
2	+トラスネジ SCREW		M5X10 C2700W CODE NO. 000-808-430	2	
3	フード HOOD		03-144-1335-1 CODE NO. 100-263-331	1	
4	フードビス HOOD RETAINER		03-144-1336-1 CODE NO. 100-266-311	2	

DWG NO. C3464-F02- E

FURUNO ELECTRIC CO., LTD

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

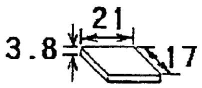
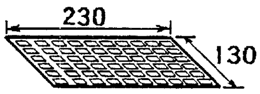
FURUNO

CODE NO.	008-485-480	03FS-X-9504 -5
TYPE	FP03-06502	1/1

付属品表
ACCESSORIES

FR-2115/2115-B
FR-2125/2125-B
FR-2155/2155-B
FR-2135S/2135S-B
FR-2135SW/2125V
FR-2165DS

船舶用レーダ
MARINE RADAR

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾕｰｻﾞｰｷｰｷｬｯﾌﾟ USER KEYCAP	 	03-144-1613-1 CODE NO. 100-263-831	4	
2	ﾕｰｻﾞｰｷｰｼｰﾄ(E) USER KEYSHEET(E)	 	03-144-1655-1 CODE NO. 100-263-881	1	

DWG NO. C3464-F04- E

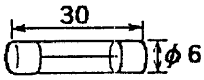
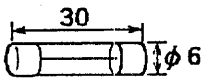
FURUNO ELECTRIC CO ., LTD

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-452-700	03EP-X-9301 -3
TYPE	SP03-10320	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR		U S E	SETS PER VESSEL
	FR-2155/2155-B FR-2125W/2165DS FR-2135S/2135SW FR-2135S-B/2825W FR-2855/2855W FR-2865SW FR-2835S/2835SW	船舶用レーダー MARINE RADAR	電源制御部用 FOR POWER CONTROL UNIT	

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE		FGBO-A 2A AC125V	1		2	000-549-062
2	ヒューズ FUSE		FGBO 10A AC125V	2		4	000-549-065

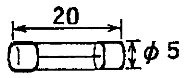
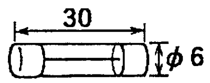
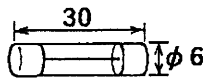
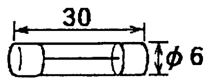
MFR'S NAME	FURUNO ELECTRIC CO.,LTD	DWG NO.	C3387-P01- D	1/1

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	008-503-460	03FS-X-9303 -5
TYPE	SP03-12506	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR		U S E	SETS PER VESSEL
	FR-2115/2115-B ~~FR-2115-B~~ FR-2125/2125V FR-2125W/2125-B FR-2155/2155-B FR-2135S/2135SW FR-2135S-B/2165DS	船舶用レーダ MARINE RADAR	指示部 FOR DISPLAY UNIT	

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE		FGMB 2A 250V	4		8	000-122-000
2	ヒューズ FUSE		FGBO 0.5A AC250V	3		6	000-549-018
3	ヒューズ FUSE		FGBO 5A AC250V	2		4	000-549-022
4	ヒューズ FUSE		FGBO 10A AC125V	2		4	000-549-065

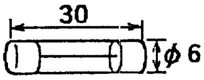
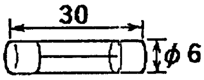
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.		1/1

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

DWG NO.
C3464-P03- D

CODE NO.	008-424-370	03DZ-X-9302 -8
TYPE	SP03-09202	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	FR-1460DS/1760DS 船舶用ﾚｰﾀﾞｰ FR-2155/2155-B FR-2165DS FR/FAR-2855 MARINE RADAR		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ FUSE		FGBO-A 2A AC125V	2		4	000-549-062
2	ﾋｭｰｽﾞ FUSE		FGBO-A 5A AC125V	1		2	000-549-064

MFR'S NAME	FURUNO ELECTRIC CO.,LTD	DWG NO.	C3357-P02- J	1/1

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	008-424-380	03DZ-X-9303 -6
TYPE	SP03-09203	BOX NO. P

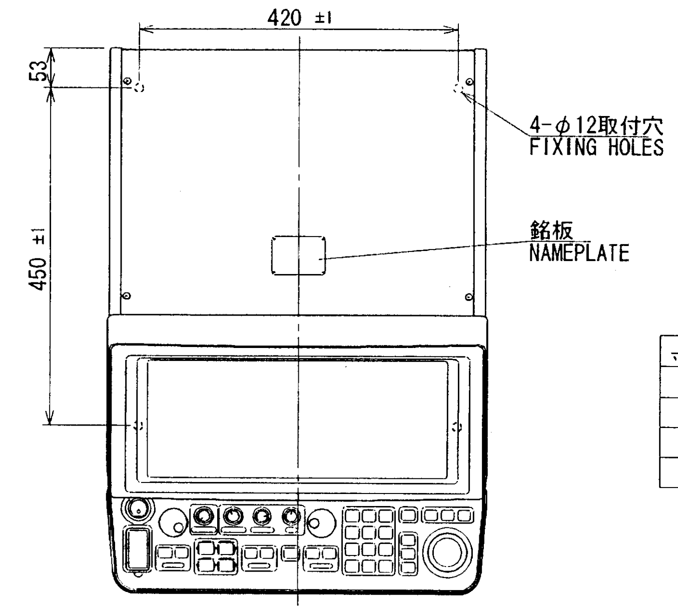
SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	FR-1430DS/1460DS 船舶用ﾚｰﾀﾞｰ FR-1760DS FR-2155/2155-B FR/FAR-2855 MARINE RADAR		

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY			REMARKS/CODE NO.
				WORKING		SPARE	
				PER SET	PER VES		
1	ｶｰﾎﾞﾝﾌﾞﾗｼ CARBON BRUSH	 	T-A01297B	4		4	000-115-023

MFR'S NAME	FURUNO ELECTRIC CO.,LTD	DWG NO.	C3357-P03- H	1/1

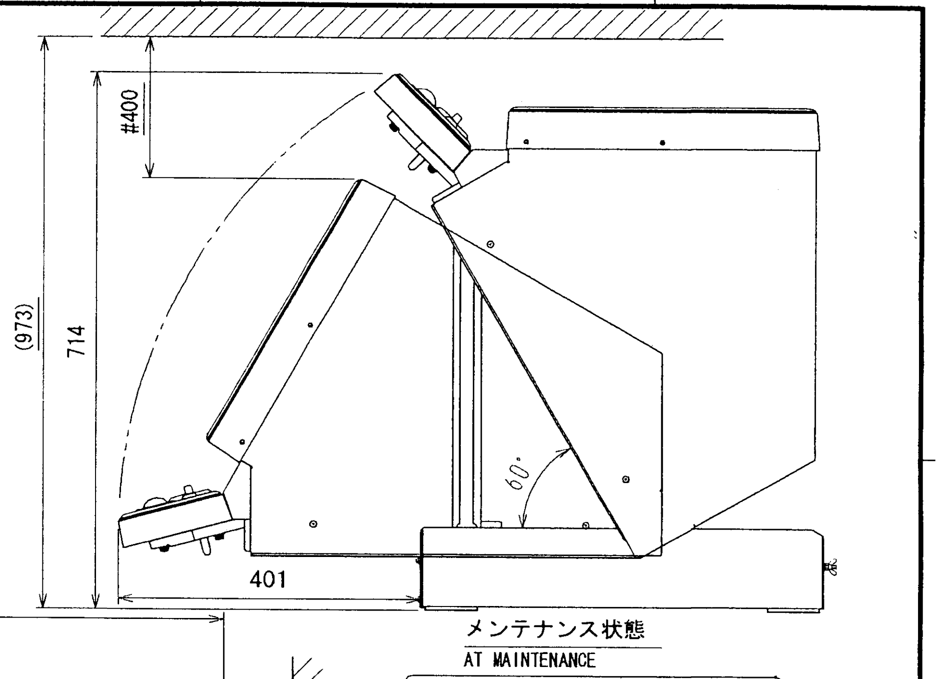
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

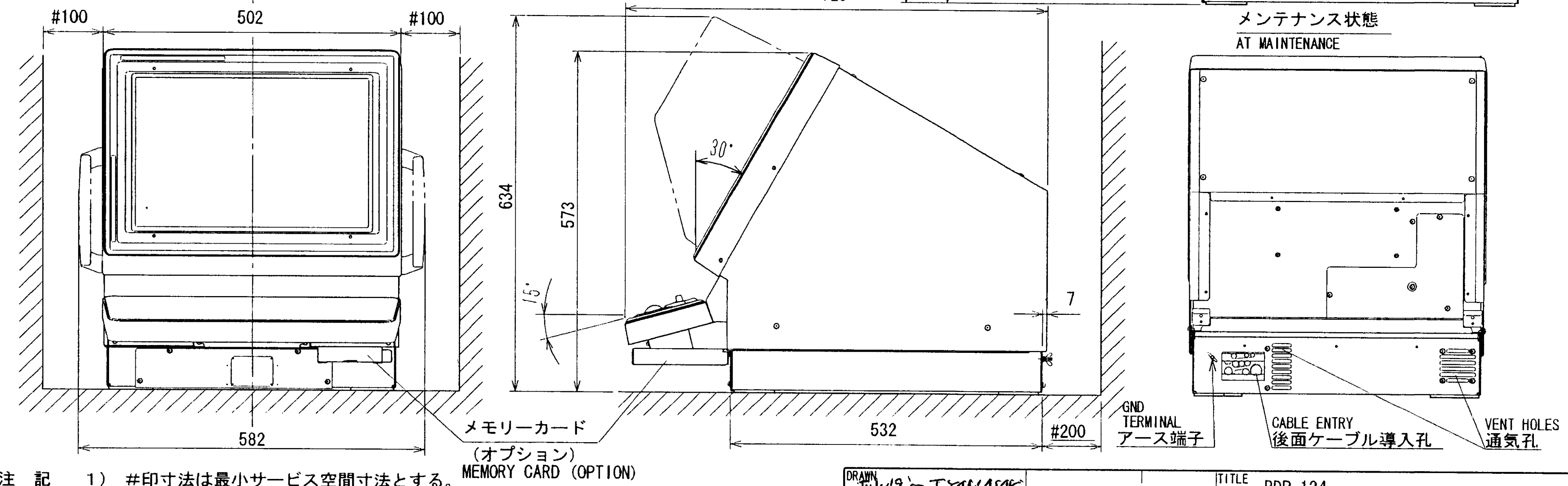
FURUNO



寸法区分(mm) DIMENSION	公差(mm) TOL.
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

表1 TABLE 1





注　記　1）#印寸法は最小サービス空間寸法とする。

2）指定外の寸法公差は、表1による。

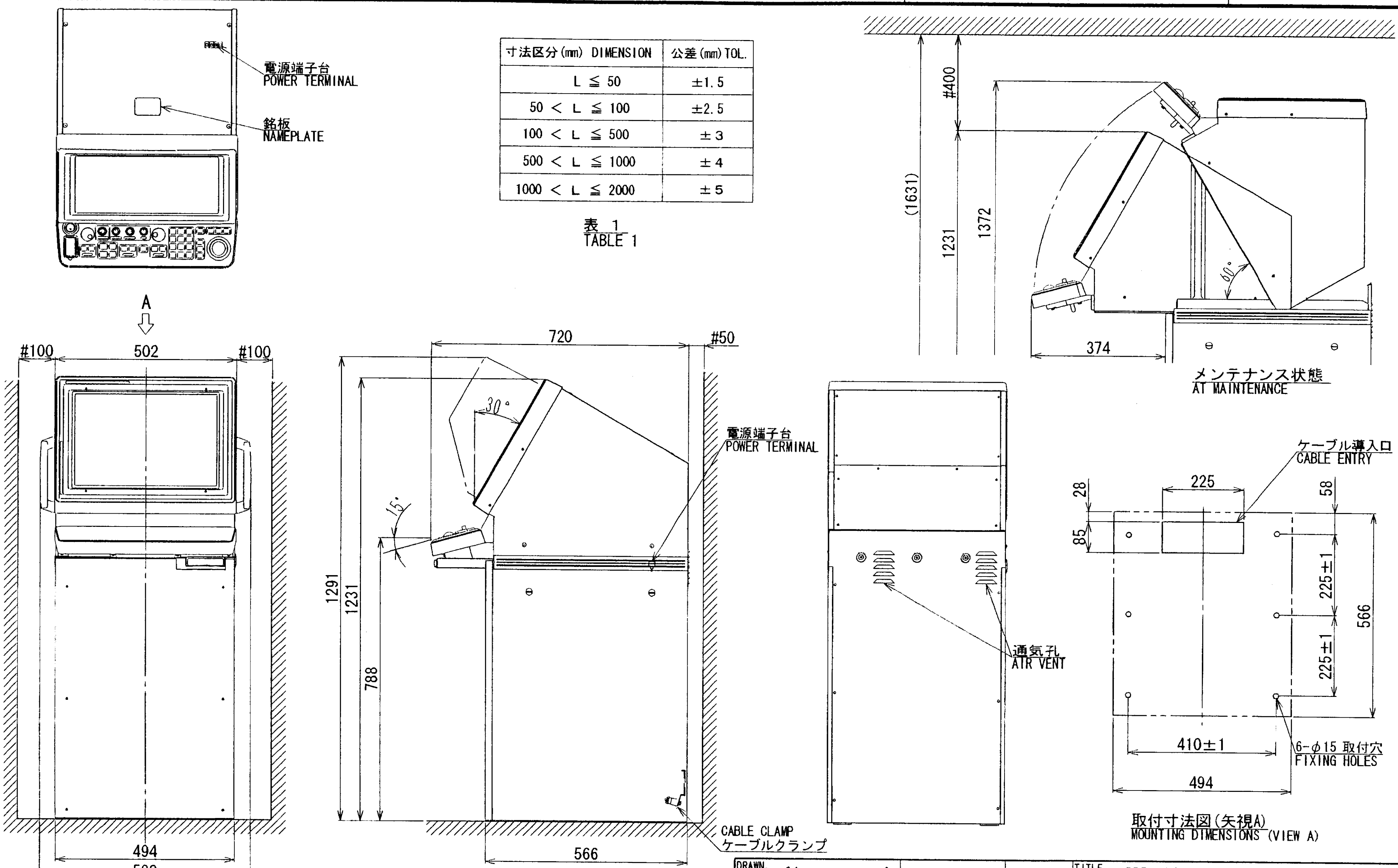
NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.

2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN July 19 '00 T.YAMASAKI		TITLE	RDP-124
CHECKED July 19 '00 Y.Kim	OTHERS	名称	指示部
APPROVED July 19 '00 Y.Kim	FR-2125 FR-2115		外寸図
SCALE 1/10	MASS 61 kg ±10%	NAME	DISPLAY UNIT
DWG. No. C3464-G01- C	03-144-1010-G3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



寸法区分 (mm) DIMENSION	公差 (mm) TOL.
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3
500 < L ≦ 1000	±4
1000 < L ≦ 2000	±5

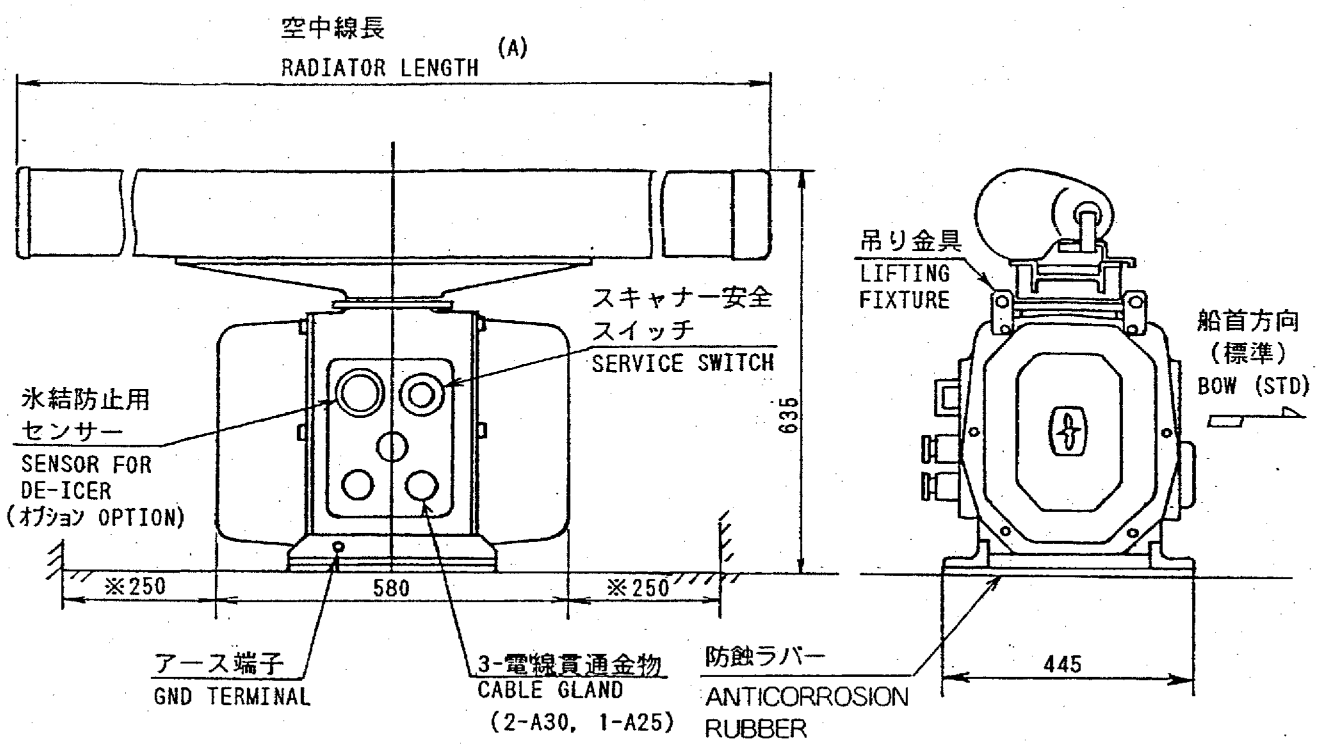
表 1
TABLE 1

注 記 1) #印寸法は最小サービス空間寸法とする。
2) 指定外の寸法公差は、表1による。

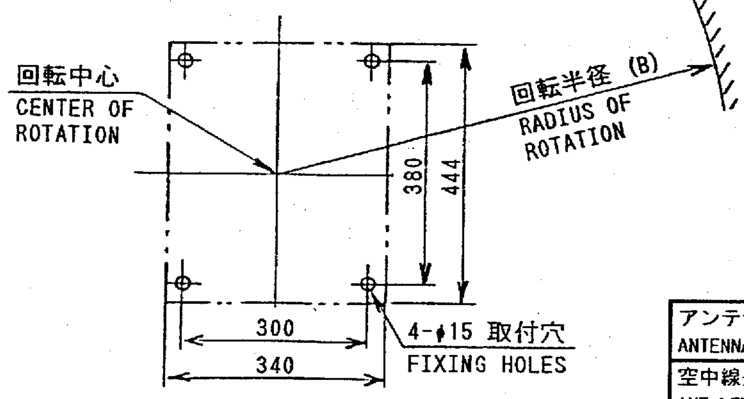
NOTE 1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN July 19 '00 T.YAMASAKI		TITLE	RDP-124
CHECKED July 19 '00 Y.K	OTHERS	名称	指示部（コンソール型）
APPROVED July 19 '00 Y.K	FR-2125 FR-2115		外寸図
SCALE 1/15	MASS 100 kg ±10%	NAME	DISPLAY UNIT (CONSOLE TYPE)
DWG. No. C3464-G03- D	03-144-1800-G6		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



※サービス空間
RECOMMENDED SERVICE CLEARANCE



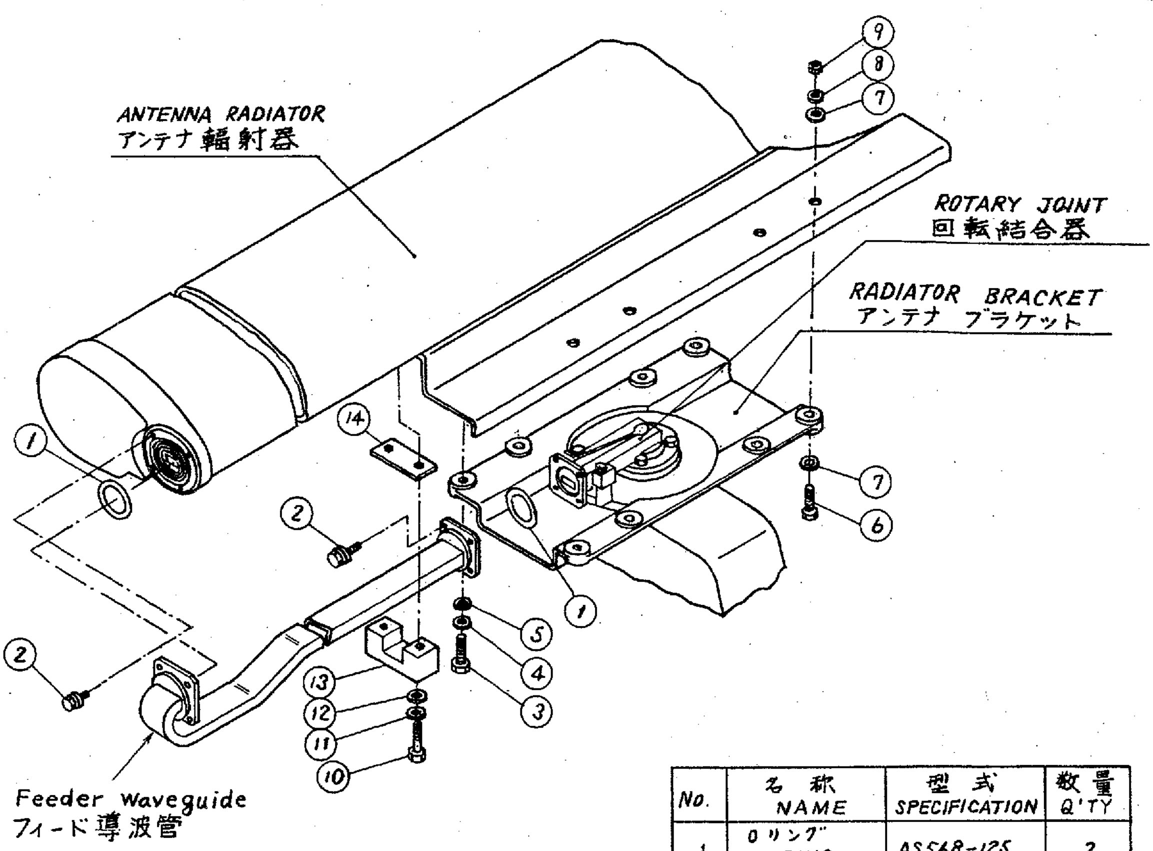
取 付 寸 法
MOUNTING DIMENSIONS

アンテナ型名 ANTENNA TYPE	XN4A	XN5A
空中線長 (A) ANT LENGTH (mm)	2570	3210
回転半径 (B) RADIUS (mm)	1350	1670
総質量 TOTAL MASS (kg)	74	77

DRAWN Sep. 2 '98 T.YAMASAKI		TYPE RSB-0049/0050
CHECKED Sep 2 '98 K.Kusunoki		名称 空中線部
APPROVED Sep 2 '98 K.Kusunoki	FR-2155	外寸図
SCALE 1/10 MASS kg	APPLICABLE TO; (MODEL) BLOCK NO.	NAME SCANNER UNIT
DWG NO. C3467-G01- A		OUTLINE DRAWING

FURUNO

D－4



No.	名称 NAME	型式 SPECIFICATION	数量 Q'TY
1	Oリング O-RING	AS568-125	2
2	六角セムス(B) HEX. BOLT(B) (WASHER HEAD)	M4×16 (SUS304)	8
3	六角ボルト HEX. BOLT	M8×35(SUS304)	4
4	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4
5	平座金 FLAT WASHER	FOR M8用(SUS304)	4
6	六角ボルト HEX. BOLT	M8x30 (SUS304)	4
7	平座金 FLAT WASHER	FOR M8用(SUS304)	8
8	バネ座金 SPRING WASHER	FOR M8用(SUS304)	4
9	六角ナット HEX. NUT	M8(SUS304)	4
10	六角ボルト HEX. BOLT	M4×30(SUS304)	2
11	バネ座金 SPRING WASHER	FOR M4用(SUS304)	2
12	平座金 FLAT WASHER	FOR M4用(SUS304)	2
13	導波管押え W/G CLAMP	RSB-2006-1	1
14	導波管間座 W/G PACKING	03-003-4003-0	1

注意:
1. 電蝕防止のため、組立時にボルト、ナット、ワッシャ及びフランジ面のOリング溝外側の部分に支給のシリコンシール剤(無酸性)を塗布する。Oリング及びOリングの溝には塗布しないこと。
2. Oリングに傷をつけたり、ゴミを付着させないように注意のこと。
3. Oリング及びスキャナーカバーのパッキンにはグリースを使用すること。シリコンシール剤は使用不可。

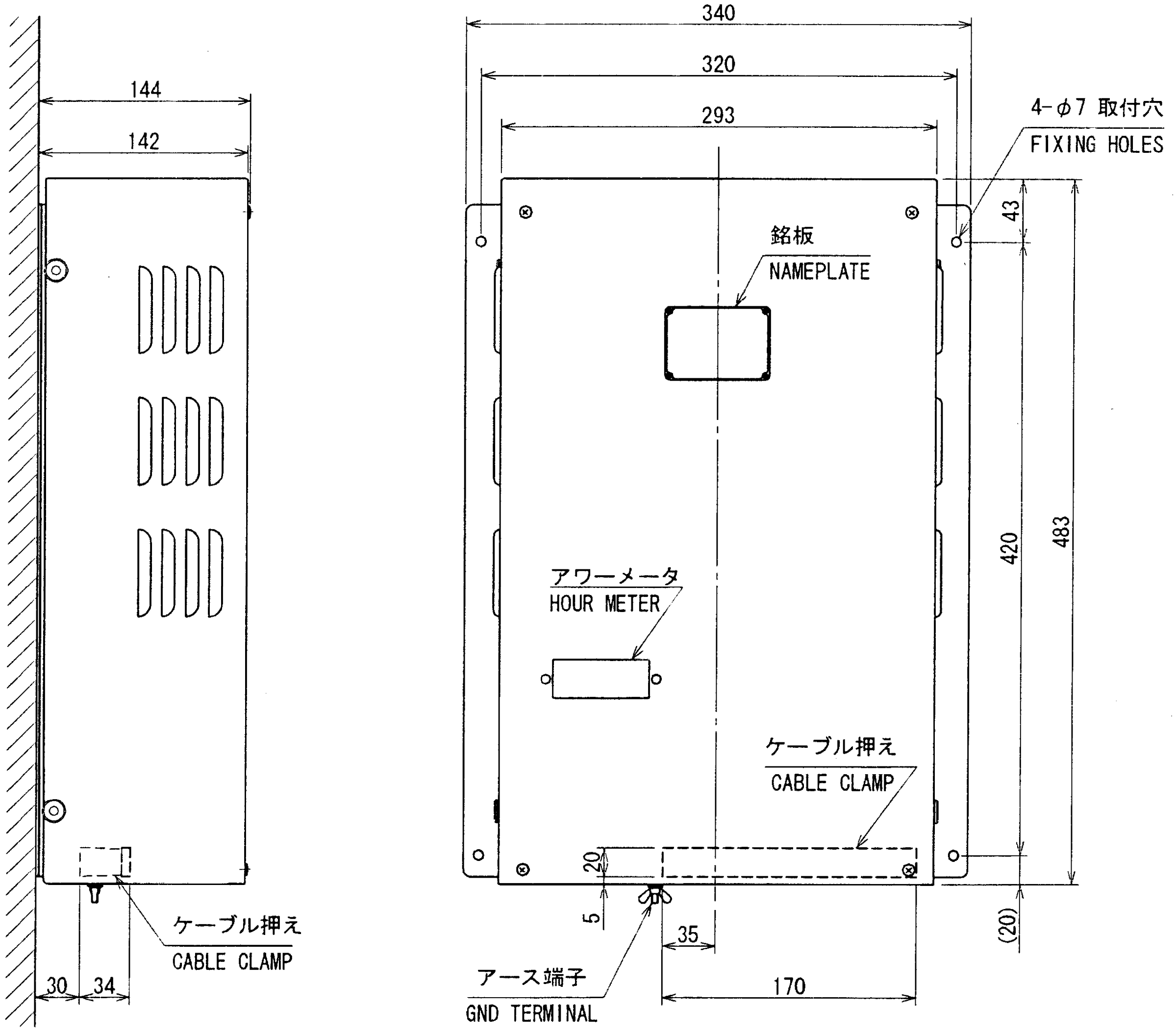
NOTE:
1. APPLY SILICONE SEALANT (SUPPLIED, NON-ACID TYPE) ON BOLTS, NUTS, WASHER AND WAVEGUIDE FLANGE OUTSIDE O-RING GROOVE TO AVOID ELECTRICAL CORROSION. (DO NOT APPLY SEALANT TO O-RINGS AND O-RING GROOVES.)
2. DO NOT PINCH O-RING AND KEEP IT CLEAN.
3. FOR PACKINGS OF SCANNER COVERS AND O-RINGS, DO NOT USE SILICONE SEALANT, BUT RATHER USE GREASE.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	MAY. 25. '79	三角法 THIRD ANGLE PROJECTION	名称 TITLE 空中線部組立図 SCANNER UNIT ASSEMBLING (XN3A/XN4A)
検図 CHECKED	MAY. 25. '79	尺度 SCALE	
製図 DRAWN	25. 5. 79	重量 WEIGHT kg	図番 DWG. NO. C3249-017-H

表１ TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3



注記

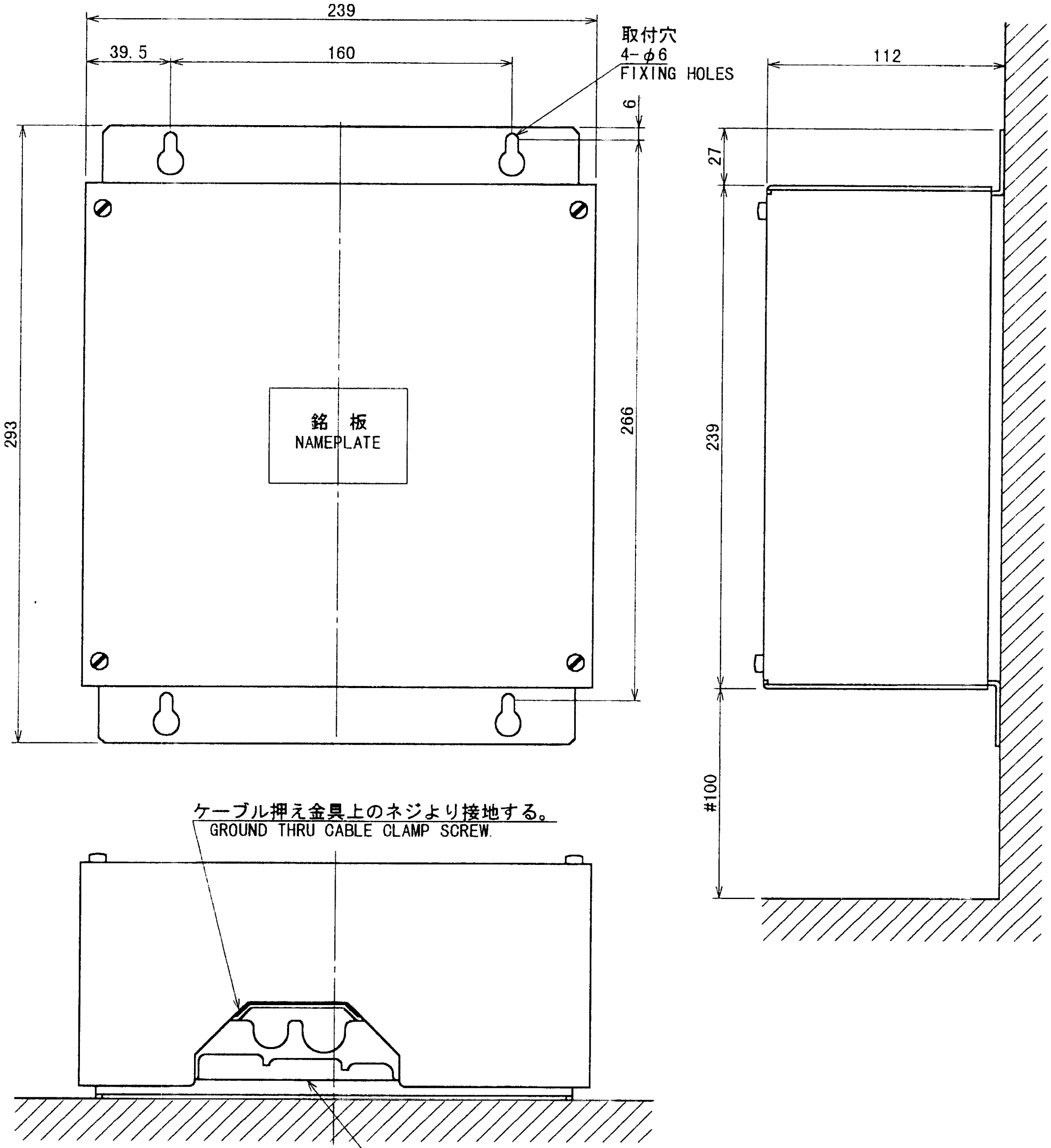
1）指定なき寸法公差は表１による。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN Aug 24 '00 T.YAMASAKI		TITLE	PSU-001/002
CHECKED Aug 24 '00 Y.K		名称	空中線電源部
APPROVED Aug 24 '00 Y.K			外寸図
SCALE 1/5	MASS 7 kg ±10%	NAME	POWER SUPPLY UNIT
DWG. No. C3353-G01- E	03-102-700G- 1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.



注記
1）指定なき寸法公差は表１による。
2）#：推奨する最小サービス空間寸法。
3）取付ネジはトラスタッピンネジ呼び径５×20を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.
3. USE TAPPING SCREWS 5x20 FOR FIXING THE UNIT.

表１ TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3

DRAWN June 27 '00 T.YAMASAKI	TITLE	PSU-004
CHECKED June 27 '00 Y.Kim	名称	電源制御部
APPROVED June 27 '00 Y.Kim		外寸図
SCALE 1/4 MASS 2.3 kg ±10%	NAME	POWER SUPPLY UNIT
DWG. No. C3385-G02- D		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

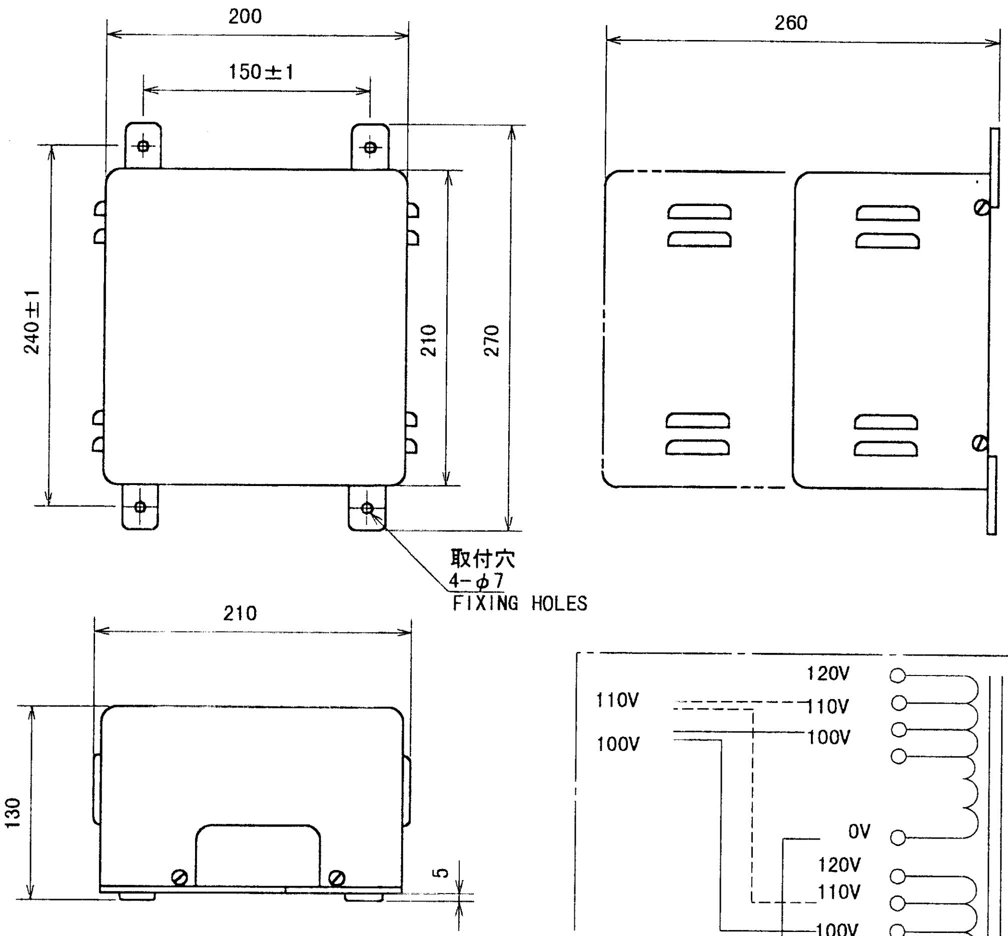
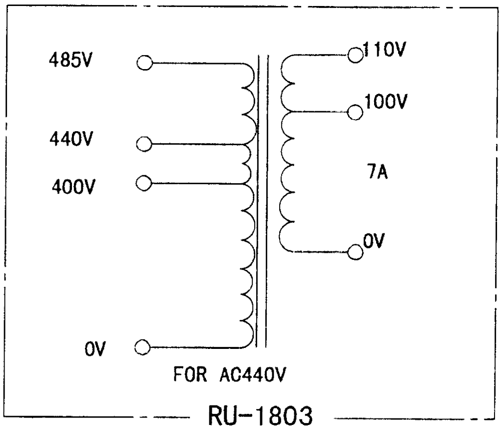
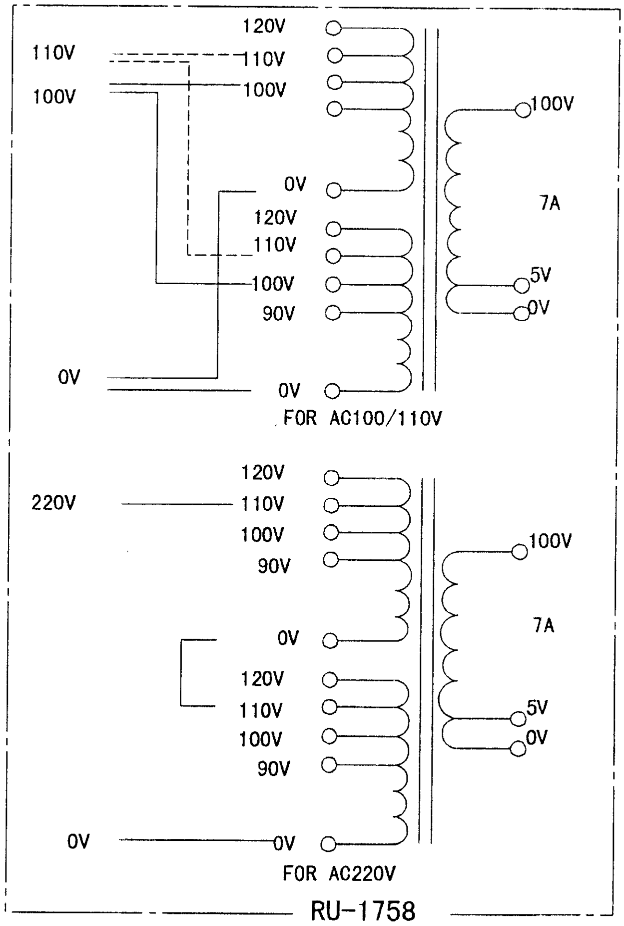


表 1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3



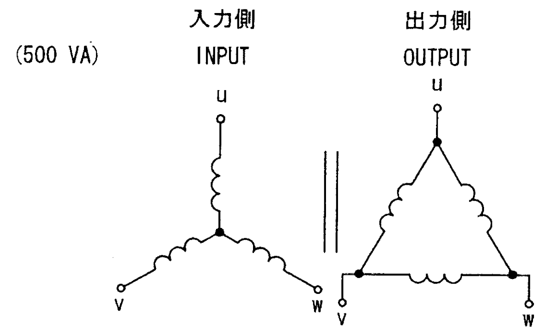


注記
1）指定なき寸法公差は表１による。

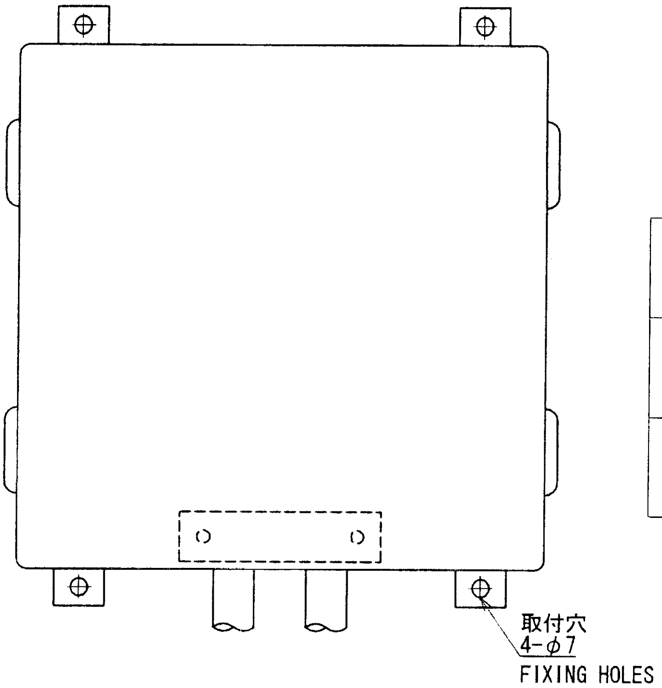
NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

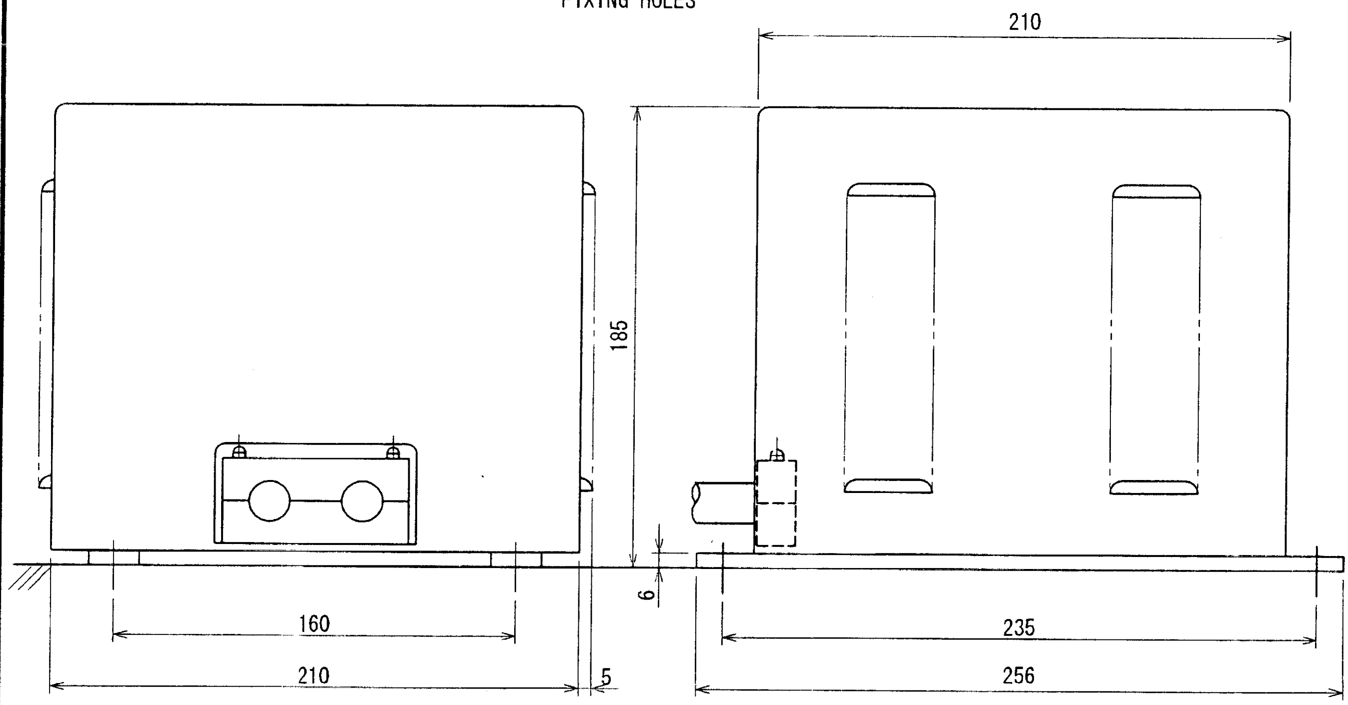
DRAWN June 28 '00 T. YAMASAKI	TITLE RU-1758/1803
CHECKED June 28 '00 Y. Kim	名称 トランスユニット 外寸図
APPROVED June 28 '00 Y. Kim	NAME TRANSFORMER UNIT OUTLINE DRAWING
SCALE 1/5 MASS 12 kg ±10%	
DWG. No. C3003-001- E	

FURUNO ELECTRIC CO., LTD.



RU-5466-1	AC440V 3φ 50/60Hz	AC220V 3φ 60Hz	AC200V 3φ 50Hz
RU-6764	AC380V 3φ 50Hz	AC200V 3φ 50Hz	
RU-5693	AC110V 3φ 60Hz	AC220V 3φ 60Hz	

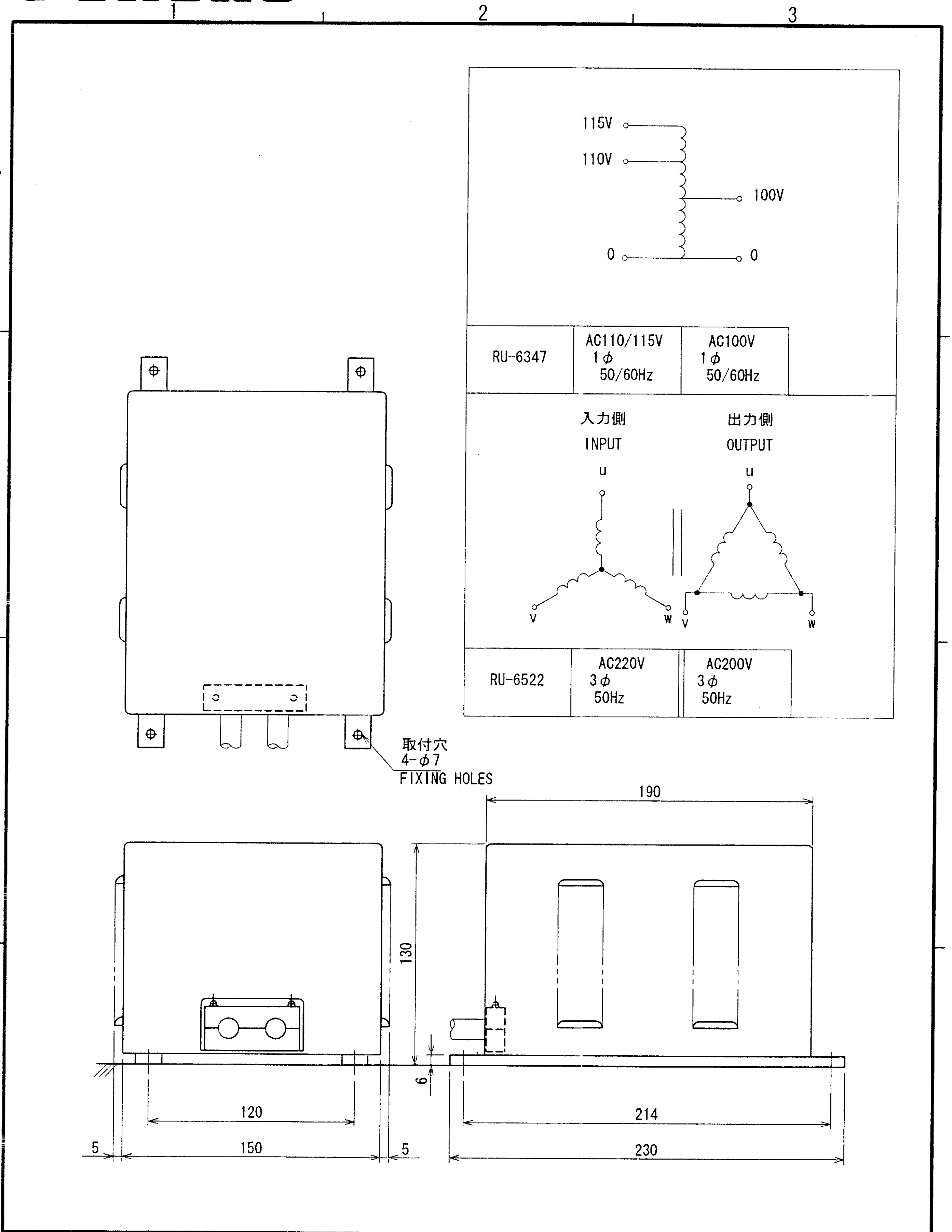




DRAWN Aug 16 '00 T. YAMASAKI		TITLE	RU-5466-1, RU-6764/5693
CHECKED Aug 17 '00 Y. K		名称	トランスユニット
APPROVED Aug 17 '00 Y. K			外寸図
SCALE 1/3	MASS 12 kg ±10%	NAME	TRANSFORMER UNIT
DWG. No. C3003-006- F			OUTLINE DRAWING

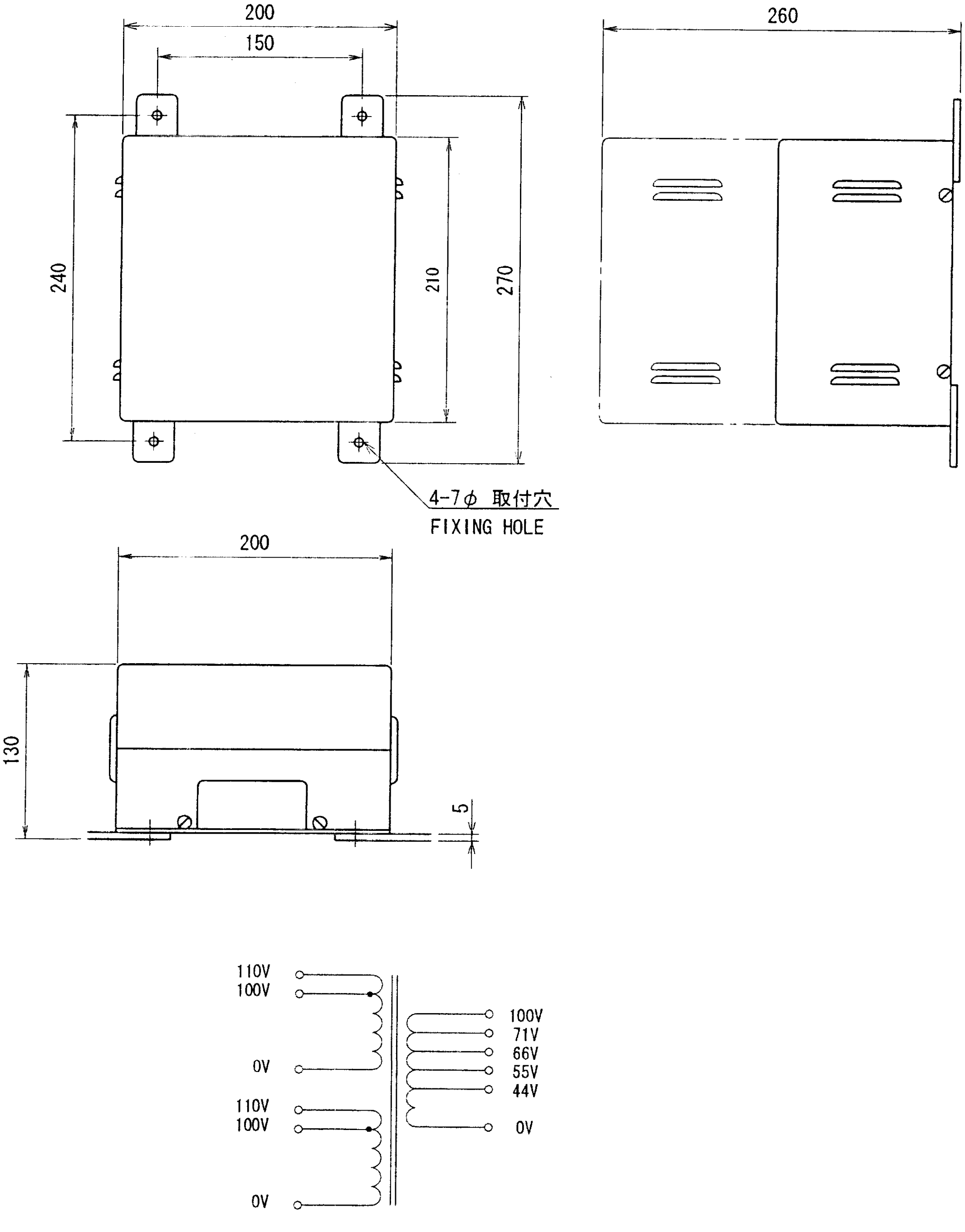
FURUNO ELECTRIC CO., LTD.

FURUNO



DRAWN Aug 16 '02 T.YAMASAKI	TITLE	RU-6347/6522
CHECKED Aug 17 '02 Y.Kimura	名称	トランスユニット
APPROVED Aug 17 '02 Y.Kimura		外寸図
SCALE 1/3 · MASS 12 kg ±10%	NAME	TRANSFORMER UNIT
DWG. No. C3003-007- C		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

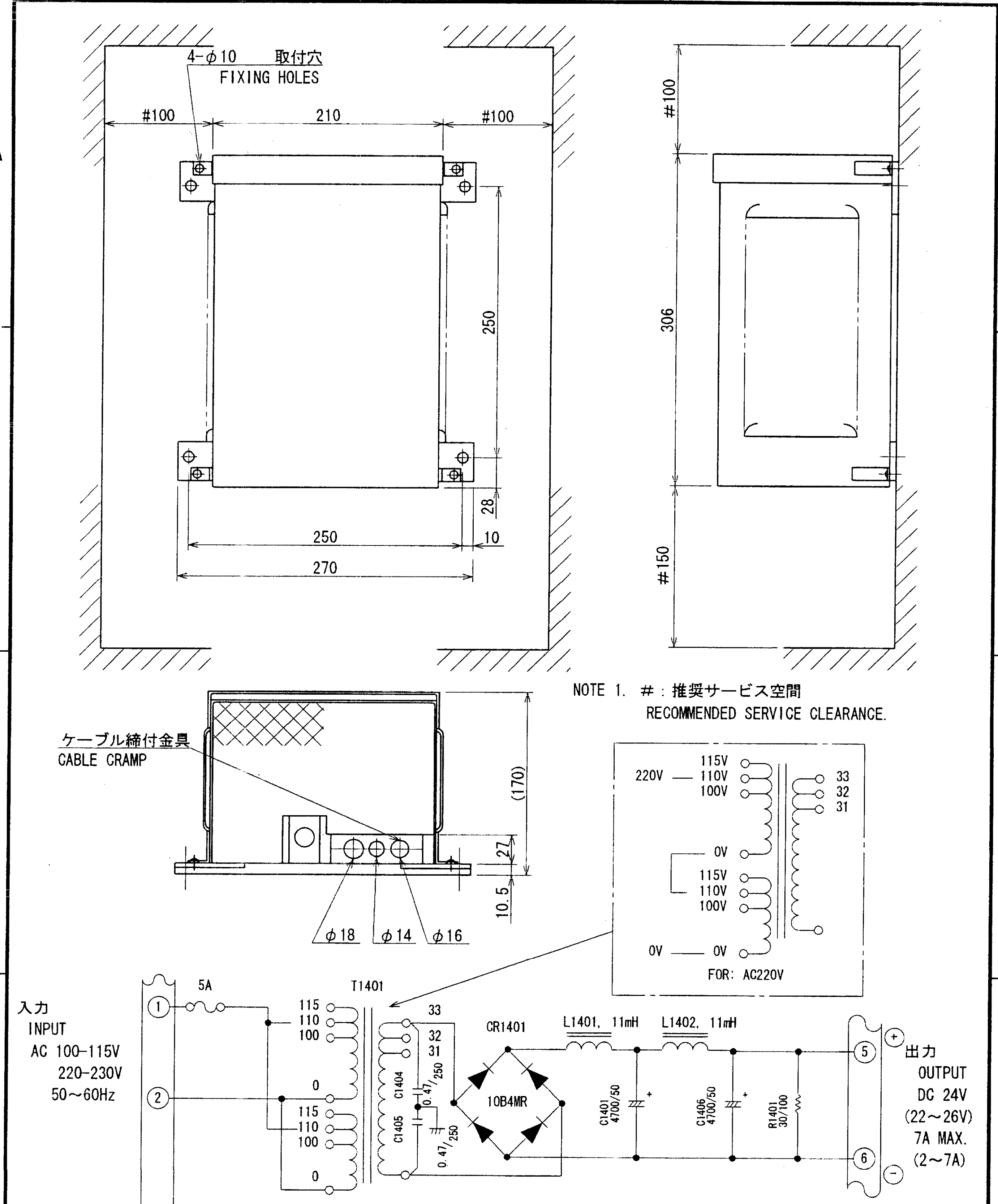


コンパス安全距離 COMPASS SAFE DISTANCE

スタンダード STANDARD	2.1 m
ステアリング STEERING	1.5 m

DRAWN Aug.16 '00 T.YAMASAKI	TITLE	RU-3305
CHECKED Aug.17 '00 T.K	名称	トランスユニット
APPROVED Aug.17 '00 T.K		外寸図
SCALE 1/5 MASS ±10% 12.2 kg	NAME	TRAMSUFORMER UNIT
DWG. No. C3003-004- D		OUTLINE DRAWING

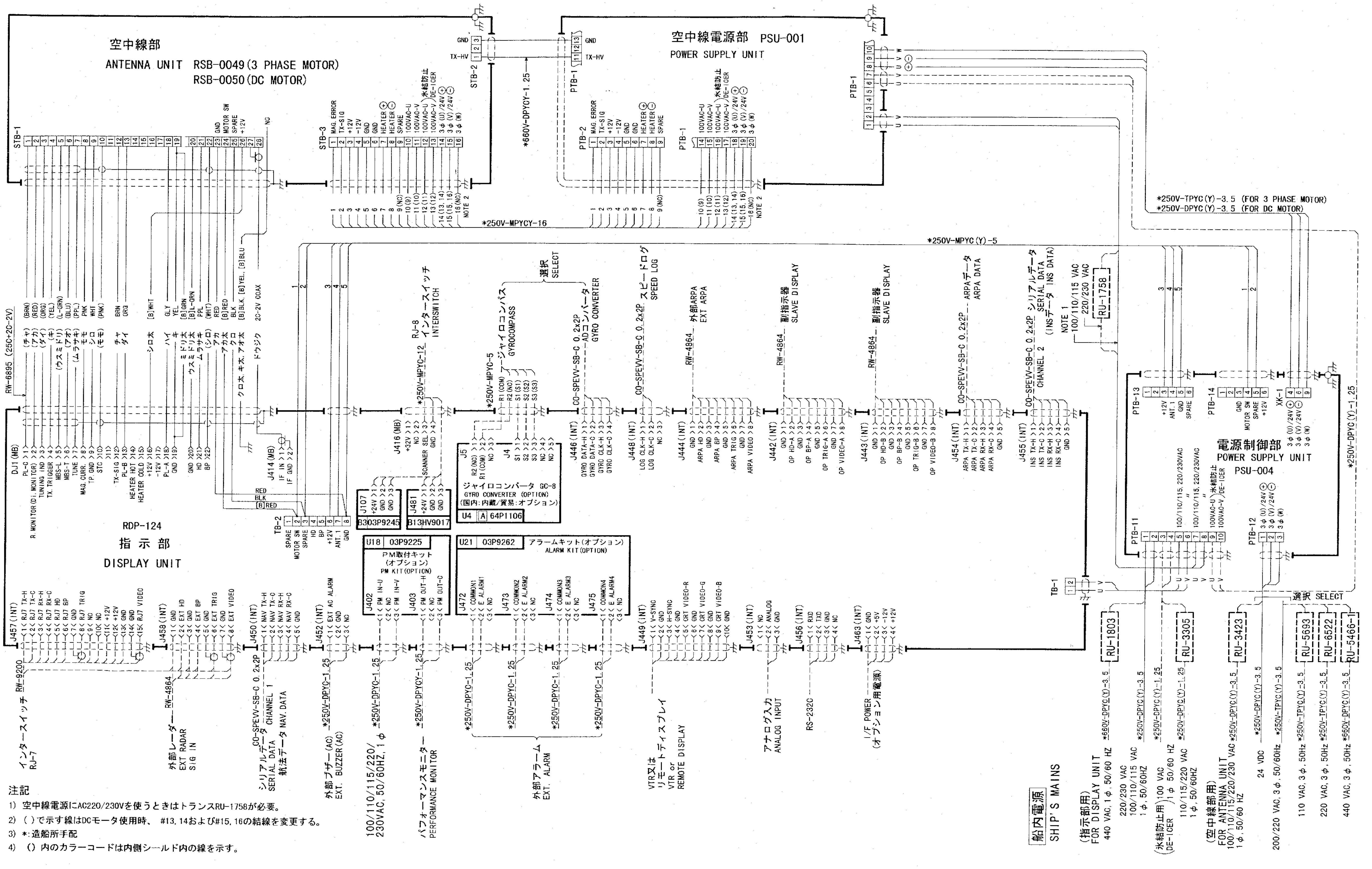
FURUNO ELECTRIC CO., LTD.



注記 AC220V 入力に対しては T1401の一次巻線を直列に接続する。
NOTE FOR 220V AC INPUT. CONNECT T1401 PRIMARY WINDINGS IN SERIES.

DRAWN Aug 16 '00 T.YAMASAKI		TITLE RU-3423
CHECKED Aug 17 '00 Y.Kimura		名称 整流器
APPROVED Aug 17 '00 Y.Kimura		外寸図
SCALE 1/5	MASS ±10% 16.5 kg	NAME RECTIFIER UNIT
DWG. No. C3002-005- L		OUTLINE DRAWING

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注記

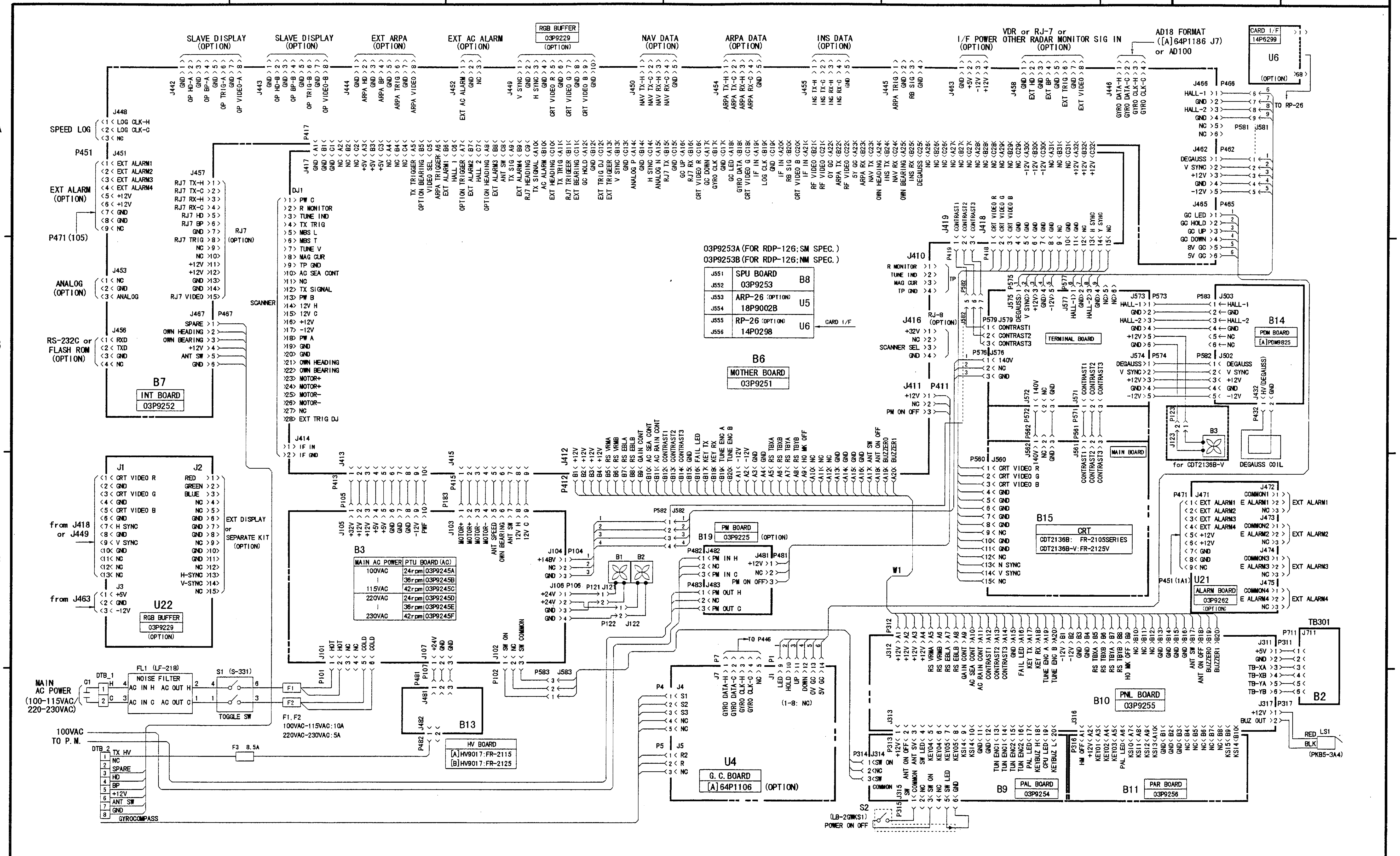
1) 空中線電源にAC220/230Vを使うときはトランスRU-1758が必要。
2) ( )で示す線はDCモータ使用時、#13,14および#15,16の結線を変更する。
3) *:造船所手配
4) ( ) 内のカラーコードは内側シールド内の線を示す。

NOTE

1. ANTENNA UNIT REQUIRES TRANSFORMER RU-1758 FOR 220/230 VAC SOURCE.
2. ( ): DC MOTOR REQUIRES CHANGING CONNECTION #13,14 AND #15,16.
3. *:SHIPYARD SUPPLY
4. WIRE COLOR CODE ( ): INSIDE WIRES, B-: BIG WIRES, L-: LIGHT COLOR.

DRAWN Nov 24 '98 T.TAMASAKI		TYPE	FR-2155
CHECKED Sep 24 '98 K.Kusunoki		名称	船舶用レーダー
APPROVED Sep 24 '98 K.Kusunoki			相互結線図
SCALE	MASS kg	NAME	MARINE RADAR
DWG. No. C3467-C01- C	03-144-6006-1		INTERCONNECTION DIAGRAM

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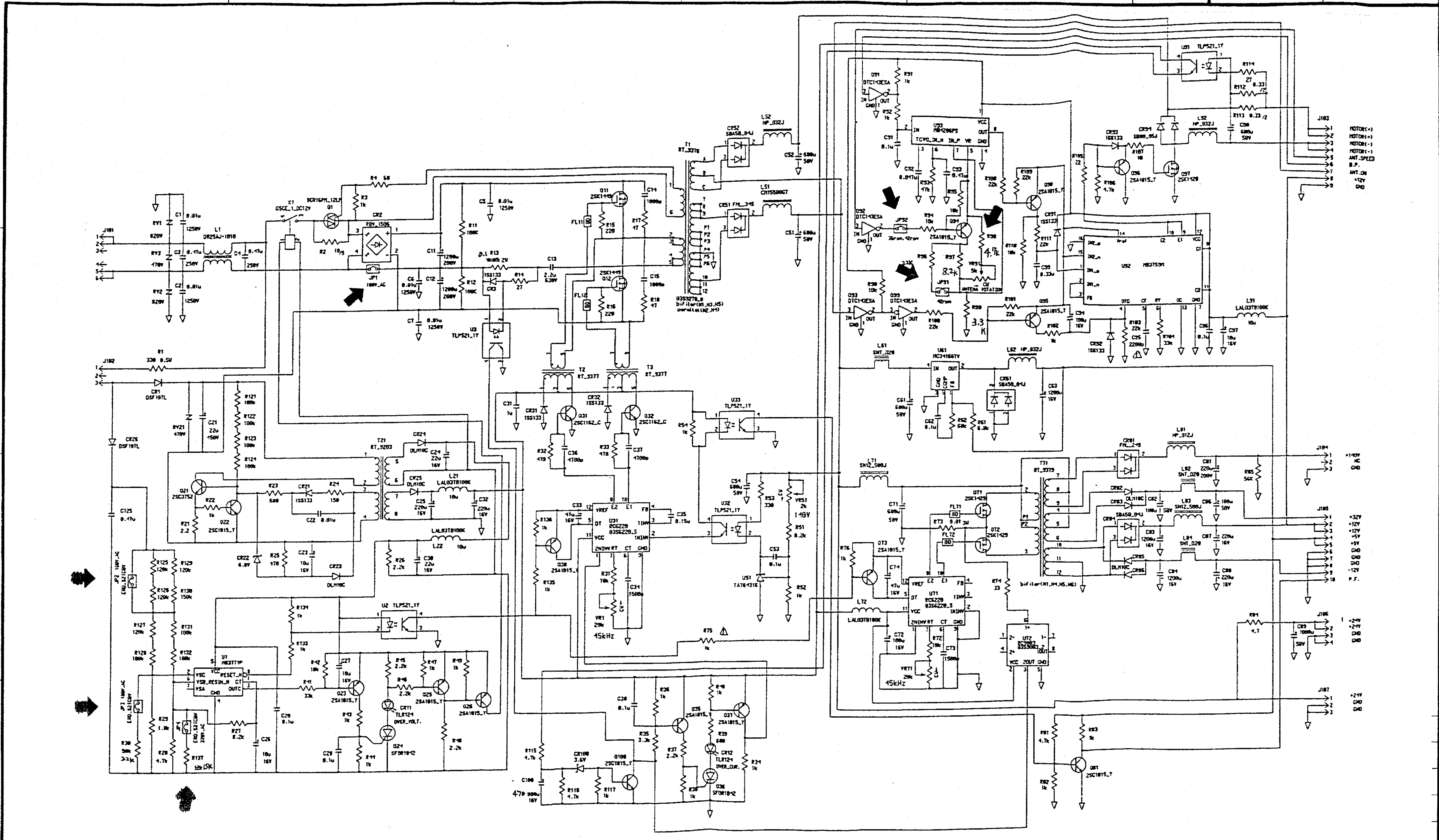
MAIN AC POWER	PTU BOARD (AC)	
100VAC	24rpm	03P9245A
|	36rpm	03P9245B
115VAC	42rpm	03P9245C
220VAC	24rpm	03P9245D
|	36rpm	03P9245E
230VAC	42rpm	03P9245F

DRAWN Jan 18 '00 T.YAMASAKI		TITLE	RDP-124/126
CHECKED Jan 18 '00 K.Kusunoki		名 称	指示部総合(AC仕様)
APPROVED Jan 18 '00 K.Kusunoki			回路図
SCALE	MASS kg	NAME	DISPLAY UNIT GENERAL (AC SOURCE)
DWG No. C3464-K01- H	03-144-6008-10		SCHEMATIC DIAGRAM

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S - 3



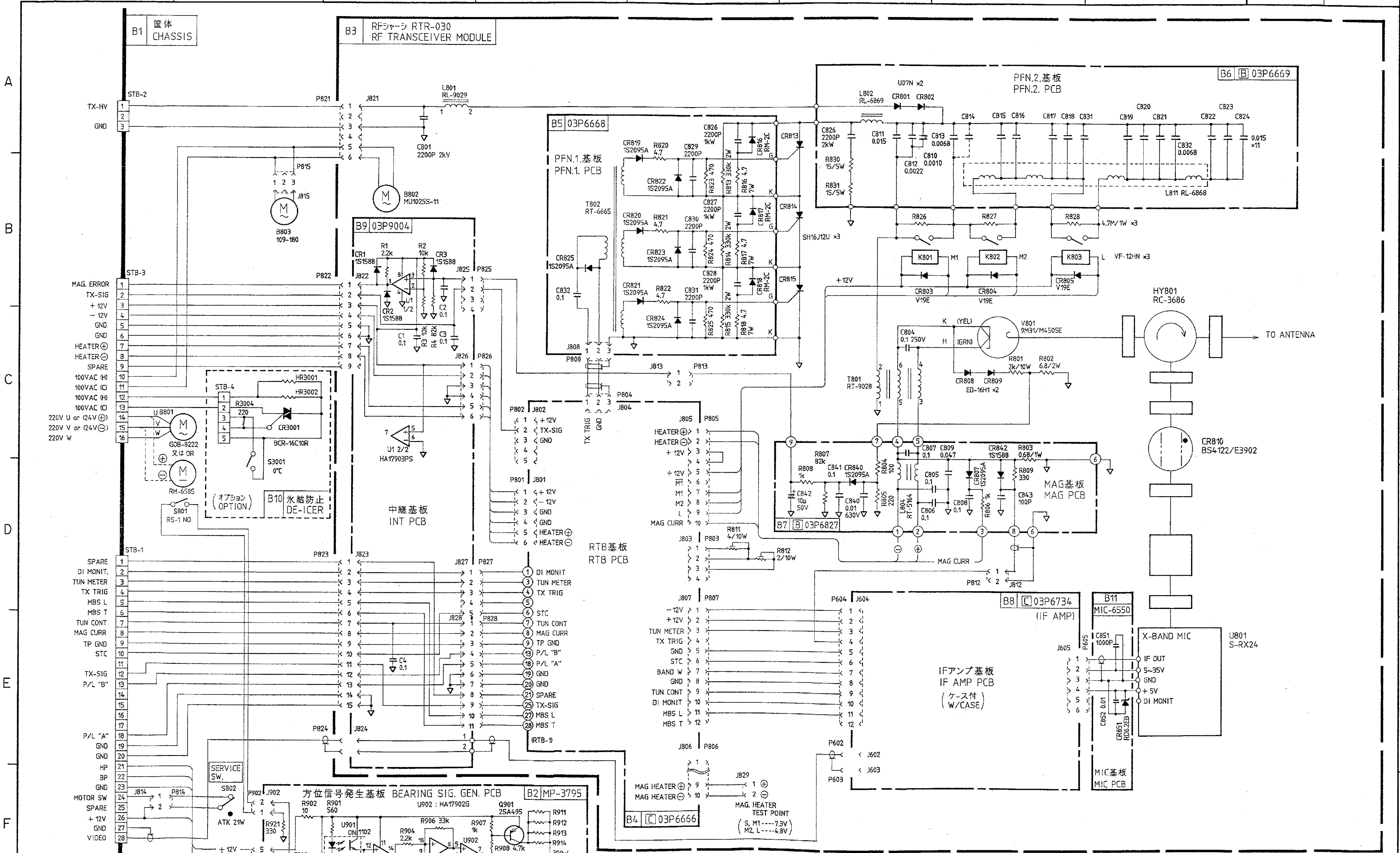
PWB	POWER	ANTENNA	JP1	JP2	JP3	JP4	JP91	JP92	R98
03P9245 A	100 VAC	24rpm	Short	Short	Short	Cut	Cut	Cut	4.7 k
03P9245 C	100 VAC	42rpm	Short	Short	Short	Cut	Cut	Short	1.2 k
03P9245 D	220 VAC	24rpm	Cut	Cut	Cut	Short	Cut	Cut	4.7 k
03P9245 F	220 VAC	42rpm	Cut	Cut	Cut	Short	Cut	Short	1.2 k

DRAWN Sep. 4 '98 E. [illegible]
CHECKED Sep 4 '98 K. Okamoto
APPROVED Sep 4 '98 M. Yamamoto
SCALE / MASS kg
APPLICABLE TO; (MODEL) FR-2125 FR-2115
BLOCK NO.
TYPE 03P9245
名称 AC電源基板 回路図
NAME PTU BOARD(AC) SCHEMATIC DIAGRAM
DWG NO. C3464-K03- C 03-144-6019- 6

FURUNO ELECTRIC CO., LTD.

FURUNO

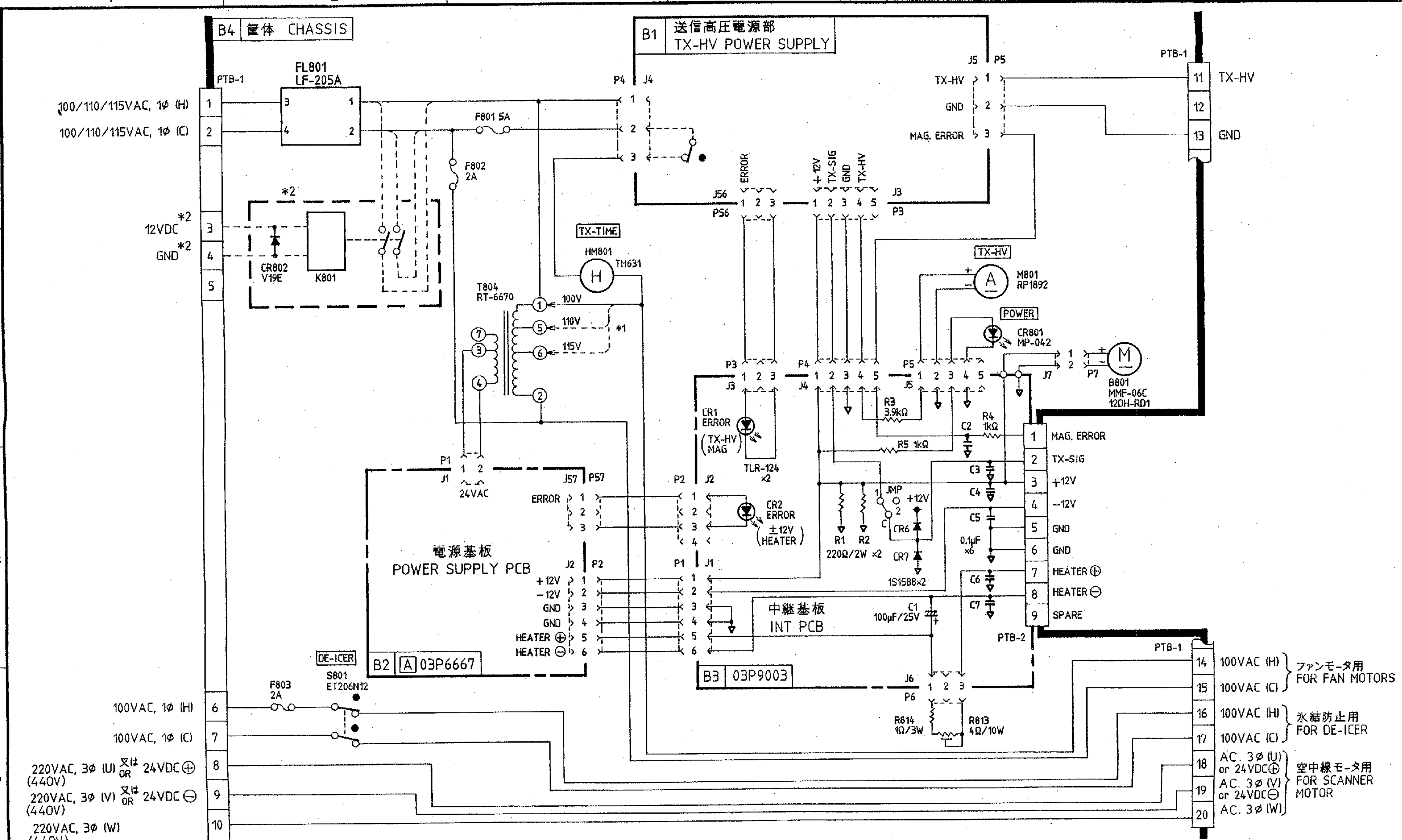
S-4



NOTE 1.
特記なき抵抗の単位は全てΩ, 0.25W 又 コンデンサはμF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN MICROFARADS UNLESS NOTED OTHERWISE.

DRAWN APR 24 '96 E. KISHIMA	FAR2855	TYPE	RSB-0049/0050
CHECKED APR 24 '96 T. SAITO	FR2855	名称	空中線部総合回路図
APPROVED APR 24 '96 K. OTA	FR2050T		回路図
SCALE / MASS kg	FR2852 APPLICABLE TO: (MODEL)	BLOCK NO. / NAME	SCANNER UNIT
DWG NO. C3353-K03- D			SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.



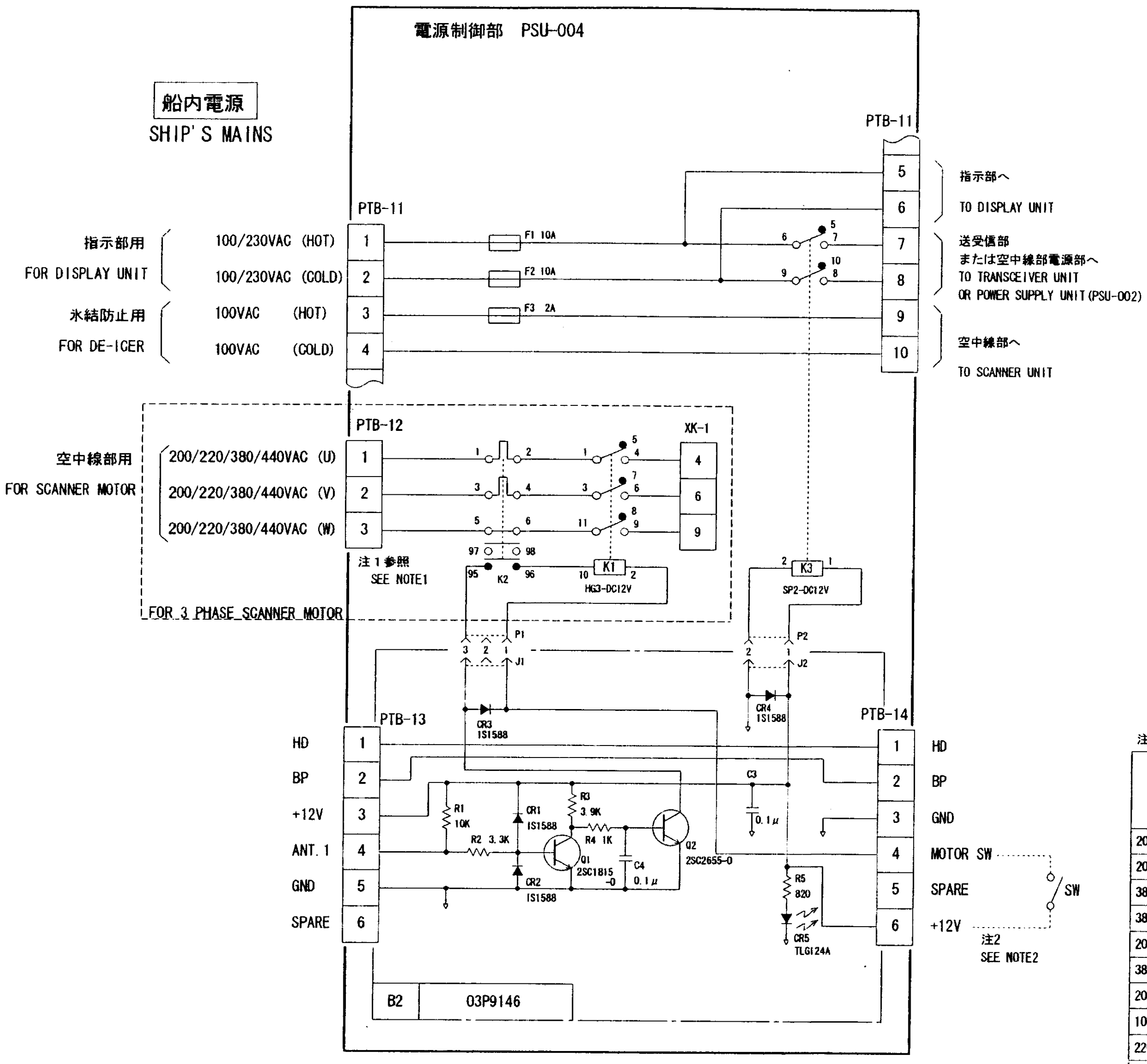
注
*1. 船内電源がAC110/115V時には，タップ変更必要。
*2. PSU-001標準品には，K801は使用しない。

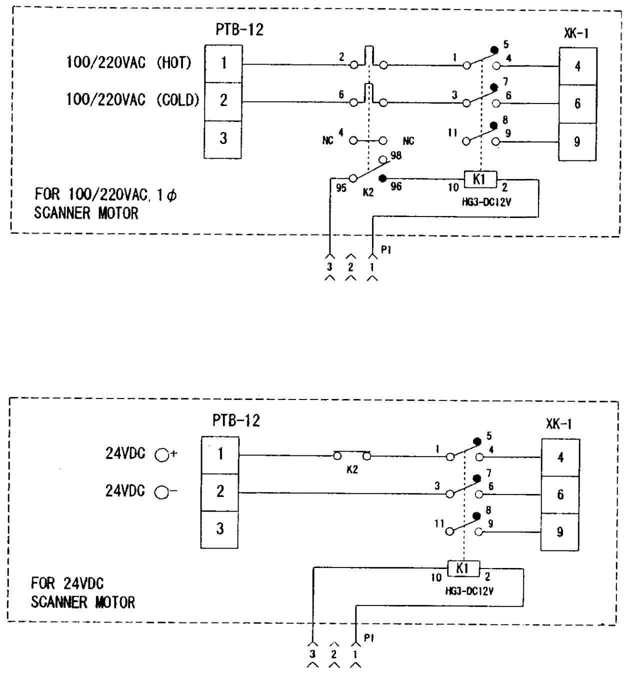
NOTE
*1. CHANGE CONNECTION FOR 110/115VAC SHIP'S MAINS.
*2. K801 IS NOT USED FOR STANDARD SET.

FR/FAR-2860S
FR/FAR-2852
FR-2050T

承認 APPROVED	APR. 25. '91 T. NAKANO	名称 TITLE	PSU-001 空中線電源部 POWER SUPPLY UNIT
検図 CHECKED	APR. 25. '91 I. AMANO		
製図 DRAWN	25th Apr. '91 HATAI	図番 DWG.NO.	C3353-K04-C

FURUNO ELECTRIC CO., LTD.





注1) NOTE 1.

船内電源 SHIP'S MAINS	空中線部 SCANNER UNIT	サーマルリレー THERMAL RELAY (K2) 形式/TYPE	設定値/SETTING
200/220VAC, 3φ	RSB-0026/0088/0089	TR-ONH/3, 1.7A	2.3A
200/220VAC, 3φ	RSB-0027	TR-ONH/3, 1.7A	2.3A
380/440VAC, 3φ	RSB-0031/0090	TR-ONH/3, 0.8A	1.0A
380/440VAC, 3φ	RSB-0032	TR-ONH/3, 0.8A	1.0A
200/220VAC, 3φ	RSB-0041	TR-ONH/3, 0.8A	0.8A
380/440VAC, 3φ	RSB-0042	TR-ONH/3, 0.36A	0.4A
200/220VAC, 3φ	RSB-0049	TR-ONH/3, 0.8A	0.8A
100VAC, 1φ	RSB-0043/0078	BMK9-04-8K	3.0A
220VAC, 1φ	RSB-0046	BMK9-04-8K	1.8A
24VDC	RSB-0050	BAC101505D	5A(not adjustable)
	RSB-0051	BAC101505D	5A(not adjustable)

注2) FR-2160DSのときはPTB-14の#4と#6を現地で短絡すること

NOTE 2. FOR FR-2160DS, PUT A JUMPER BETWEEN #4 AND #6 OF PTB-14 AT INSTALLATION.

DRAWN	Sep 13 '00 T.YAMASAKI	TITLE	PSU-004
CHECKED	Sep 13 '00 Y. Kim	名称	電源制御部
APPROVED	Sep 13 '00 Y. Kim	FR-28**SERIES FR-21**SERIES	回路図
SCALE	MASS kg	NAME	POWER SUPPLY UNIT
DWG No.	C3385-K01- E		SCHEMATIC DIAGRAM

FURUNO ELECTRIC CO., LTD.